THE SOLAR SPECTRUM, λ6600 TO λ13495

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1. Introduction

The research described here has developed from a plan of solar investigation outlined by Dr. George E. Hale.[1] † His views on the relation of solar spectroscopy to the evolution of stars and to the basic properties of matter were shared by Professor C. A. Young:[2] ". . . the more detailed study of the solar spectrum under various conditions and its comparison with the results of laboratory work are sure to throw light in both directions—to give us on the one hand a better understanding of the sun and its conditions and on the other to make more intelligible the nature and behaviour of molecules and molecular forces."

In the hope that our results may contribute to the solution of such problems, we dedicate this work to the inspiring memory of these two pioneers in solar research.

When Sir William Herschel[3] announced his discovery of an extension of the solar spectrum beyond the visible red he opened a new field of knowledge. With a glass prism, a few thermometers, and a watch he began an exploration which is still incomplete.

Sir William Abney[4] was the first to report fine details in the infrared solar spectrum. Through the application of his remarkable photographic technique he measured absorption lines as far as λ9867.

Almost simultaneously S. P. Langley[5] invented the bolometer and showed the existence of absorption lines throughout the infrared to approximately 5μ. He found that the great gaps in the spectrum, already mapped roughly by Sir John Herschel,[6] are due to absorption in the earth's atmosphere.

Recent bolometric observations by C. G. Abbot and H. B. Freeman[7] at higher dispersion plainly reveal the three *Ca* II lines near λ8600, several lines of *H*, and less conspicuous details due to *Fe* and *Mg*. In addition these records established the existence of some atmospheric absorption bands previously unrecognized. One of these is the O_2 band near λ12680 predicted by R. S. Mulliken[8] and first recognized by G. Herzberg[9] (see Table A). As a result of rather low resolving power, bolometric solar data are of greatest value, not for the detailed analysis of the solar atmosphere, but for the measurement of the spectral distribution of radiant solar energy, for which they are unsurpassed.

† References are to the bibliography, at end of book.

A map of the solar spectrum, λ2988 to λ8350, by George Higgs[10] was made by the use of dyed photographic emulsions. Although not accompanied by any measurements or interpretation, it is a useful guide to the spectrum.

H. A. Rowland,[11] in the title of his *Preliminary Table of Solar Spectrum Wave-Lengths,* implied that he was continuing his work into the near infrared, where he had already measured visually some lines for use as standards of wave length beyond the limit, λ7330, of his published Table.

W. F. Meggers[12] published a photographic map of the solar spectrum from λ6800 to λ9600 and measured 2400 absorption lines on spectrograms of the east and west limbs of the sun which he obtained at the Allegheny Observatory[13] in the range λ6500 to λ9000.

K. Burns[14] published a map of the solar spectrum from λ9000 to λ9900, and discussed some of the instrumental difficulties of early work in the photographic infrared, but gave no wave lengths. F. S. Brackett[15] measured more than 500 lines between λ9000 and λ9849. He found that about 10 per cent of the lines originate in the sun, and gave the first correct identifications of a few of these.

The present writers were associated with C. E. St. John, E. F. Adams, and Miss Louise Ware in the preparation of the *Revision of Rowland's Preliminary Table of Solar Spectrum Wave-Lengths*[16] (referred to hereafter as RR), which contains, as a supplement, nearly 1700 wave lengths between λ7330 and λ10216. Of these about 250 were identified, mostly with chemical elements whose presence in the sun was already known.

The *Photometric Atlas of the Solar Spectrum* by M. Minnaert, G. F. W. Mulders, and J. Houtgast[17] is an elaborate and unique addition to solar literature. In our frequent references we shall call it "the Atlas."

A. Adel[18] has recently extended the prismatic solar spectrum with thermocouples from 14μ to 24μ, and M. Migeotte[19] has recorded, with a grating and thermocouple, the region from 1.3μ to 1.5μ with extraordinary precision.

J. L. Greenstein, L. G. Henyey, and P. C. Keenan,[20] in discussing the "Interstellar Origin of Cosmic Radiation at Radio Frequencies," give references to original observations which show that the sun emits discernible radiation at wave lengths between 1 cm and 5 m.

The research which we shall describe was begun in 1925 at the Mount Wilson Observatory and has been enlarged in scope from time to time, as instrumental facilities have improved. Many technical details are omitted here because they have appeared in preceding papers. In the bibliography, references marked with an asterisk (*) have special bearing on the present work, or, in some cases, announce results already derived from it. The monograph by Migeotte[19] contains an excellent bibliography.

2. Instruments

Besides the equipment described in the references designated by an asterisk (see above), the Hale Solar Laboratory[21] in Pasadena has been available since 1938. Here a 21-foot concave grating in an Eagle mounting permits the use of either of two achromatic solar images (diameters 44 cm and 16 cm) throughout the photographic range of the spectrum. A plane-grating spectrograph of 75 feet focus is useful as far as λ10000. The greater part of our data have been obtained with an excellent 6-inch concave grating ruled in the instrument shop of the Observatory in 1924 by J. A. Anderson and the late C. Jacomini.

A few spectrograms of the solar disk have been made in the region λ13000 with concave gratings of 1 and of 2 m radius. The best of these, obtained for us at the Snow telescope on Mount Wilson by H. W. Babcock, extend to λ13500 and furnish the basis for the last part of Table A. His unpublished chromospheric data, obtained with the same equipment and also with the 150-foot tower telescope, at shorter wave lengths, have been freely utilized by us.

Miscellaneous spectrograms of the solar disk, spots, and limb (λ<9000A) have been made for us on Mount Wilson by J. C. Duncan, S. B. Nicholson, and the late F. Ellerman to supplement our observations in Pasadena.

3. Wave Lengths in Table A

Wave lengths are expressed on the International scale of 1928,[22] for which the standard conditions of the (dry) air in the spectrograph are a temperature of 15° C and a pressure of 760 mm of mercury. Under our observing conditions the corrections for temperature and pressure have been generally negligible for wave lengths less than 10000A. We point out, however, that few reliable values of the refractivity of dry air for λ>10000A are available, and that, for ordinary laboratory air, it may be unsafe to assume that at λ13000, near a great absorption band of water vapor, the refractivity is approximately the same as it is near λ8500.

Wave lengths in Table A for lines known to originate in the sun have been corrected in the usual manner to remove the effects of orbital and diurnal motion of the spectrograph relative to the sun. Details of this procedure are given in earlier papers.[23]

The wave lengths in Table A include our earlier measurements with interferometers, not only of lines which have now been adopted as International Standards, but of many others. The standards are stated exactly as adopted by the International Astronomical Union, not as measured at Mount Wilson alone. Other wave lengths having three decimals are weighted means of our interferometer and grating results when both are available, otherwise they come from accordant measurements with gratings only. Wave lengths given to two decimal places are of lower weight.

Where International Standards are lacking we have interpolated between our own interferometer values, or, beyond their limit (λ10604), have referred to adopted solar standards in overlapping orders of concave-grating spectra.

Most of the wave lengths have been derived from grating spectrograms with a dispersion of about 2.5 A/mm, but many difficult lines have been measured at 1.25 or at 0.7 A/mm, and for wave lengths beyond λ13000 the dispersion was reduced to about 16 A/mm.

Among the numerous diffuse lines some are so difficult to see that micrometer settings on them are less satisfactory than simple readings of a scale with the aid of a hand magnifier. On high-dispersion spectrograms numerous lines of *Mg*, *S*, and *N*, and others of unknown origin have been measured in this way.

Since the wave lengths in RR were expressed on the International scale of 1922, which was found slightly erroneous and was superseded by the present scale in 1928, a small systematic difference will be noted in the range λ6600–λ7330 between RR and our Table A. Corrections to RR as they appear in *Trans. I. A. U.*, IV, 60, 1932, are as in table 1.

Some wave lengths in the first part of Table A are followed by R to indicate that they have been derived from RR with the aid of the corrections in table 1 or of others slightly greater which apply between λ6790 and λ7330.

The infrared supplement to RR, λ7330–λ10216, was referred to the scale of 1928 and requires no systematic correction.

Our observations confirm most of Rowland's weak

lines from λ6600 to λ7330, but we reject about 70 of them as spurious. Rowland himself doubted the reality of many of the faintest lines in his Table, but L. E. Jewell,[24] who measured most of his spectrograms, insisted on including them, remarking, "Also he [Rowland] did not favor the measurement of the very faint lines of the solar spectrum which were difficult to see, and, in fact, he disbelieved in the existence of many of them. . . . Upon these points we were not in agreement at all, and as a result a sort of compromise was arrived at."

Comparison of our interferometer measurements from λ7569 to λ9899 with those made at the Allegheny Observatory with the collaboration of the National Bureau of Standards[22] shows remarkable agreement. For 229 lines the Mount Wilson wave lengths show no significant systematic difference from the Allegheny values, and the average difference between the two series is only slightly more than 1 part in 5 million. For 126 additional lines our grating wave lengths in Table A differ from the Allegheny interferometer results by only about 1 part in 2 million on the average.

TABLE 1

Corrections to wave lengths in Revised Rowland Table

Region	Subtract from 1922 λ
<4000A	0.001A
4000–5600	0.002
5600–5780	0.003
5780–5960	0.004
5960–6125	0.005
6125–6290	0.006
6290–6455	0.007
6455–6630	0.008
6630–6790	0.009

In the range λ7000–λ7569 our wave lengths are systematically about 0.006A lower than those found by Fr. Francis Sullivan[25] by measurement of interferometer spectrograms made at the Allegheny Observatory.

Beyond λ9900, solar wave lengths by other observers are lacking with the exception of a very few by M. Migeotte[19] between λ13442 and λ13495. These were obtained with his recording spectrometer with grating dispersion. Although superlative in their field, they scarcely serve as a close check on our wave lengths. For eight lines our wave lengths average 0.6A greater than those of Migeotte.

The wave lengths in Table A contain internal evidence of the absence of serious systematic errors. For example, the occurrence of numerous lines in the spectrum of *Fe* I can be predicted, and their wave lengths computed, from a table of term values for this spectrum, the terms being well evaluated from combinations of observed wave lengths. Hundreds of such predictions have been made for which no lines of iron have yet been observed in the laboratory. But in the solar spectrum so many otherwise unidentified lines appear at the predicted positions that they can unquestionably be ascribed to *Fe* I. In their analysis of the spectrum of *Fe* I, H. N. Russell, C. E. Moore, and D. W. Weeks[26] stated the differences between the wave numbers of predicted lines and of the corresponding solar lines in Table A. From their table C we select 320 of these differences and average them in five equal groups in table 2. The final mean value in table 2, $-0.006\ \mathrm{cm}^{-1}$, indicates that our measured wave lengths of these weak solar lines are about 0.005A greater than the corresponding arc wave lengths would be if the lines were measurable in the arc.

The predicted positions of the lines in table 2 were derived from a varied collection of wave lengths, partly measured with arcs burning in the open atmosphere and

TABLE 2

Observed solar wave numbers compared with computed arc values for 320 predicted lines of *Fe* I

Region	O − C
λ6609–λ7072	$-0.01\ \mathrm{cm}^{-1}$
7074– 7484	±0.00
7486– 8358	−0.01
8369– 8950	±0.00
8956–10987	−0.01
Mean	$-0.006\ \mathrm{cm}^{-1}$

partly with the arcs in evacuated containers. Assuming a correction of −0.01A, as indicated by the work of H. D. Babcock,[27] to express the computed positions on the scale appropriate to the vacuum arc alone, the mean difference, solar wave length *minus* computed vacuum arc wave length, would have been about +0.015A.

If in addition we adopt C. E. St. John's[28] conclusion that at the center of the solar disk lines like these are displaced toward the violet as though by a radially outward velocity of 0.22 km/sec, and if we modify the observed wave lengths so as to remove the effect of such a velocity, the difference, solar *minus* terrestrial wave length, becomes +0.021A. The predicted gravitational displacement for solar lines in this part of the spectrum is +0.019A. Such an agreement is not a demonstration of the gravitational effect, but it is suggestive, and it illustrates the fact that exact coincidence between solar and terrestrial lines is not to be expected.

Other evidence confirms the absence of serious systematic errors in our wave lengths, as we have concluded in earlier papers[23,29] from consideration of term differences and series relations in spectra other than that of iron.

Although the International system of secondary stand-

ards of wave lengths in the *Fe* arc spectrum appears in the *Revised Multiplet Table* of C. E. Moore[40] (hereinafter called RMT), other wave lengths there have necessarily been collected from many sources. The reliability of the wave lengths in RMT therefore varies over a wide range. For example, the wave length of the iron arc line λ6677.993, an adopted secondary standard, is probably correct within 1 part in 5 million, but the line of *C* I which is given in RMT with laboratory wave length 11894.9A is really a double line, whose components are λ11892.90 and λ11895.86 in the solar spectrum. Numerous other examples could be cited. The determination of radial velocities by comparison of infrared stellar wave lengths with laboratory values is therefore subject to considerable uncertainty, but if solar data are used for reference more reliable results may be expected.

4. Intensities in the Spectrum of the Solar Disk

Intensities of solar lines are usually discussed on the tacit assumption that they are constant. Such a supposition is probably valid for most lines when estimated intensities with mean errors of ±1 Rowland unit are observed in integrated sunlight or in the undisturbed central region of the disk. But the strongest lines of *H* and *Ca* II are well known exceptions to the rule, and the *He* line at λ10830 has been found to vary over a range of several units. For the ordinary solar lines, however, statistical evidence on the degree of constancy is lacking. It is quite possible that small variations of intensity occur in many lines, especially when a large, well defined image of the sun is in focus on the slit of the spectrograph.

The advantage of expressing intensities of infrared lines on the scale used by Rowland is obvious, but it is to be noted that his scale is not uniform in meaning. For example, G. F. W. Mulders[80] found that Rowland's intensities exhibit peculiar systematic differences in their relation to equivalent width, particularly in the region λ5000 to λ6000. Mulders ascribed these anomalies to the characteristics of the photographic emulsions used by Rowland, but a more plausible explanation is that, beginning in the green region and continuing into the red, Rowland used the first-order spectrum instead of the higher orders which had served for shorter wave lengths. As we remark later from our own experience, a considerable change of dispersion introduces difficulty in maintaining the zero point of a scale of eye estimates.

In his calibration of the Rowland scale of intensities Mulders used the original estimates of Rowland as far as λ7330, and the preliminary Mount Wilson estimates, given in the infrared supplement to RR, beyond that point. Attention is called to the marked changes of intensity shown in Table A of the present work as compared with RR, and to the modification thus required in Mulders' calibration. Our measurements of equivalent width are systematically in excellent agreement with his, and the average individual difference is about ±10 per cent. Column 2 of table 4 confirms the fact that in the green region Rowland's intensities must be increased by about 3 units to make them accordant with his estimates in the red.

The scale of reference for our visual estimates of intensity was derived in the following manner: Profiles of the solar lines between λ6229 and λ6500 were made with a microphotometer, and all members of each Rowland intensity class were compared. The type line best representing each intensity class (except 8) from −1 to 9 was selected, and after small adjustments for smoothing the relative values, the scale shown in table 3 was adopted.

TABLE 3

Scale of intensities

λ RR	Element	Rowland	Adopted
6251.845........	*V*	−1	−1
6271.289........	*Fe*	0	0
6223.996........	*Ni*	1	1
6238.396........	*Fe* II	2	2
6247.569........	*Fe* II	2	3
6237.334........	*Si*	3	4
6232.655........	*Fe*	3	5
6219.294........	*Fe*	6	6
6252.572........	*Fe*	7	7
6230.742........	*Fe V*	8	9

On each of a series of spectrograms made with the same instrument that was used for most of the intensity estimates, the lines of table 3 were marked with their adopted intensities. These spectrograms, now called scale plates, had purposely been given various background densities to adapt them for comparison with the infrared plates on which intensities were to be estimated. A scale plate of appropriate density was placed with its marked lines successively coincident, end to end, with the infrared lines, and the latter were assigned intensities equal to those of the scale which they most nearly resembled.

Visual estimates for classes −2 and −3 were made without the aid of standards of comparison. Similarly, but with more uncertainty, the few solar lines stronger than 9 have been estimated, though they lack counterparts in the scale of table 3.

Two or more independent estimates were made by one of the writers (C. E. M.) from λ6600 to λ11320. These were extended and checked by the other author and by our assistants. Beyond λ11320 intensities have been estimated by comparison with lines from overlapping orders on the same plates. Beyond λ12800 this procedure was applied to enlargements on paper from the original negatives.

These data relate to the undisturbed central region of the solar disk, imaged by a telescope of 150 feet focus on the slit of an astigmatic spectrograph. Comparison of our disk intensities with those from integrated sunlight may show small differences; the spectrum of the solar limb is characterized by intensities which for many lines are quite different from those in Table A.

Between λ6600 and λ10000 the intensity estimates described above have been supplemented by a much smaller number of others derived from higher-dispersion spectrograms. The advantages thus gained in the treatment of some close groups of lines are partly offset by the greater difficulty of maintaining the zero point of the scale.

For interpreting the estimated intensities in physical terms we have derived from the Atlas the equivalent widths of 164 solar lines by integrating their profiles with a planimeter. Lines of normal sharpness were chosen in four fairly compact groups, more diffuse lines in one widely scattered group; see table 4, columns 2, 3, 4, 5, and 8, respectively. A sixth group, column 6, is taken from the work of C. W. Allen.[31] In each of these columns the equivalent widths, expressed in milliangstroms, are mean values for the corresponding intensity classes of column 1.

In table 4 we have assigned the measured equivalent widths to our original eye estimates of intensity, or to those of Rowland, except as follows: In column 4, at mean wave length λ7325, our estimates in classes 6 to 10 inclusive have been reduced by 1 Rowland unit; for the data of column 6, λ8807–λ11000, our estimated intensities have been increased 1 unit for classes 3 to 10, 2 units for classes −1 to 2 inclusive, and 3 units for class −2. Column 7 shows averages of the equivalent widths in columns 3, 4, 5, and 6.

Most of table 4, including Rowland's intensities near λ6300 and ours for greater wave lengths, shows satisfactory accordance. The systematic difference between sharp and diffuse lines is smaller than might have been expected.

The mean values of W in column 7 of table 4 are repeated in column 2 of table 5, where they are followed by results computed from the empirical relation $I=13.9 \log W-21.5$. The differences, O−C, are insignificant from $I=4$ to $I=10$, but they indicate that the observed quantities are too small for the weaker lines, as might be expected for reasons associated with the limitations of microphotometers.

In column 5 of table 5, column 8 of table 4 is repeated, and is followed by values of W computed from $I=$

TABLE 4

Measured equivalent width (W), estimated intensity (I), and wave length

I	W (in milliangstroms)						
	Normal lines						Diffuse lines
	λ5415 to λ5576 (24*)	λ6229 to λ6471 (29*)	λ7086 to λ7588 (38)	λ8207 to λ8763 (23)	λ8807 to λ11000 (170†)	λ6229 to λ11000 (260‡)	λ6721 to λ8752 (50)
0..	36	17	....	10	....	14	26
1..	51	29	30	22	25	26	32
2..	57	41	40	37	45	41	39
3..	89	55	52	51	50	52	47
4..	117	70	64	67	68	67	56
5..	132	83	89	81	87	85	71
6..	198	100	101	97	99	99	87
7..	....	117	113	112	115	114	106
8..	316	138	128	130	130	132	130
9..	....	164	144	150	150	152	158
10..	....	....	....	172	180	176	199

( ) Number of lines in parentheses.
*Intensities by Rowland.
†Equivalent width by C. W. Allen.
‡W is the mean from columns 3, 4, 5, and 6.

TABLE 5

Relations between estimated intensity (I) and equivalent width (W) (unit 0.001A)

I	Normal lines			Diffuse lines		
	W		O−C	W		O−C
	Obs	Comp		Obs	Comp	
0.........	14	35	−21	26	26	0
1.........	26	42	−16	32	32	0
2.........	41	49	− 8	39	39	0
3.........	52	58	− 6	47	47	0
4.........	67	68	− 1	56	58	−2
5.........	85	81	+ 4	71	71	0
6.........	99	94	+ 5	87	87	0
7.........	114	112	+ 2	106	107	−1
8.........	132	132	0	130	132	−2
9.........	152	157	− 5	158	161	−3
10.........	176	186	−10	199	197	+2

11.33 log $W-16$. Here the differences, O−C, in column 7 show no systematic discordance for weak lines, perhaps in part because the limitations of the microphotometer mentioned above are less stringent in the case of wider, shallower lines.

Table 5 would seem to give assurance that the relations stated above connecting I and W may be applied with confidence to solar lines that fall between the groups of table 4 for which W was derived from integration of the Atlas curves.

The measured equivalent widths which are averaged in table 4 have been correlated with the central absorptions for the same lines, as given in the Atlas. Results are collected in table 6, which shows smoothed values of W expressed in milliangstroms. It appears that for central absorption between 20 per cent and 60 per cent a simple relation connects equivalent width and wave length, such that if $W(\lambda)$ and $W(6300)$ are the respective equivalent widths of a line of wave length λ and a line near $\lambda 6300$ having the same central absorption, $W(\lambda)/W(6300)=(\lambda/6300)^{1.7}$.

TABLE 6

EQUIVALENT WIDTH (W), CENTRAL ABSORPTION, AND WAVE LENGTH

λ \ Central absorption	20%	30%	40%	50%	60%
	W (in milliangstroms)				
5415–5576 (mean 5490)	19	35	51	71	97
6229–6471 (mean 6300)	25	42	60	85	120
7086–7588 (mean 7325)	33	53	77	110	154
8207–8763 (mean 8540)	44	75	106	145	200

Within the limits of table 6 the equivalent width is found for any line of known central absorption as follows: If the line falls within one of the tabulated wave-length groups, W is obtained by interpolation; for a line in the interval between two groups, W is taken from the data for $\lambda 6300$ and corrected by the exponential relation stated above. From the value of W the intensity on the Rowland scale, as it appears at $\lambda 6300$, is given by table 4.

By this short method over 200 additional values of equivalent width have been derived for solar lines in Table A. The corresponding intensities, like those represented in table 4, have been substituted in Table A for the original estimates, from which they differ, on the average, less than ±1 Rowland unit. Such differences are mainly the errors in our estimated intensities, but occasional differences of 2 or 3 units between estimated and derived intensity cannot be accounted for in this way. As noted above, the possibility remains that some lines, apart from those affected by chromospheric conditions, really vary by small amounts.

In Table A the instrumentally derived intensities are given where they are available, since they are more significant than visual estimates. For the following classes of lines, however, the original estimates are retained: lines beyond the range of calibration, either in wave length or in intensity; blends which involve a solar line; atmospheric lines; sunspot lines.

The inadequacy of a mere series of numbers for expressing the intensities of solar lines is constantly apparent. No single parameter is sufficient, whether it be an intensity number, the equivalent width, or the central absorption. When both the equivalent width and the central absorption are stated a clearer idea of the character of the line is conveyed than by either quantity alone. In Table A we are limited to the use of a number and a few qualifying symbols, described in section 16 below.

If the sharpness, F, of a solar line is defined as the ratio of its central absorption to its equivalent width, some results which we have obtained from the Atlas may be combined as in table 7, where we give mean values of F for a few lines of different elements. The central absorption here has been expressed in per cent and the equivalent width in milliangstroms. The dependence of F on the wave length has been ignored because of the few lines available for the light elements. The data for *Fe*, etc. in the last line of table 7 include a few lines of *Ni*, *Cr*, and *Ti*. If weights proportional to numbers of lines are assigned to the data for *Mg*, *O*, *Si*, and *Na*, we find their mean atomic weight is 25 and mean sharpness 0.34. Comparison of these numbers with those for the ferrous metals shows that the sharpness is nearly proportional to the square root of the atomic weight, a result first found for emission lines in the laboratory by A. A. Michelson.[32]

The data for *Fe*, etc. in table 7 are well distributed in wave length, and may be divided into two nearly equal groups with mean wave lengths 7200A and 8200A. The mean values of F for these groups are 0.58 and 0.43, respectively, which are nearly in the inverse ratio of the squares of the mean wave lengths, as would be expected.

We conclude that intensities of solar lines estimated by experienced observers from suitable spectrograms are on the average nearly as dependable as those obtained by instrumental measurement. The average uncertainty of an estimate is less than ±1 Rowland intensity unit.

TABLE 7

SHARPNESS (F) AND ATOMIC WEIGHT

Element	No. lines	At. wt.	F
Mg	6	24	0.25
O	5	16	0.35
Si	22	28	0.36
Na	1	23	0.24
Fe, etc.	48	56	0.50

Systematic errors in visual estimates may result from a large variation in the dispersion, e.g. 2 to 1, or from sacrifice of resolving power actually realized on the spectrograms, as when plates of coarse grain are employed. For the weakest lines the trained eye can provide more useful information than is given by a microphotometer. For the strongest lines, such as those of *Ca* II and of *H*, the eye is baffled by the wings and tends to assign an intensity too much dependent on the core. Tables 4 and 5 show that our estimated intensities maintain, after correction for small systematic errors, a linear relation to the logarithms of the measured equivalent widths, an analogy with Fechner's law connecting sensation and stimulus.

5. Intensities of Atmospheric Lines

Intensities of atmospheric lines in Table A are eye estimates from numerous plates. No claim to homogeneity can be made for these numbers because of the great range of variability which atmospheric lines exhibit, and because it is obviously impracticable to photograph at one time 7000A of the solar spectrum under high dispersion. Our aim has been to describe these lines as they appear at a station near sea level, with solar zenith distance about 45°, under average atmospheric humidity for the climate of Pasadena. It is unlikely that this hope has been even remotely realized.

A new intensity class, −4, appears in Table A, where it is associated with certain lines in the band spectrum of atmospheric oxygen which are so weak that they are observed only with very long air paths, as when the sun approaches the horizon.

Atmospheric lines whose intensities are written (20) or greater have been described from rough measurements of their total width. Intensity numbers proportional to the width have been assigned, such that (50) corresponds approximately to a width of 1A. The term "width" here signifies the linear distance between the limits within which the line appears to lie, and is to be clearly distinguished from the technical expression "equivalent width."

The purpose of describing strong telluric lines in this special manner is to show the extent of the local regions of obscuration which they produce in the solar spectrum. The usefulness of such information is obvious in the identification of solar lines by the physical method as contrasted with the statistical method, as will appear later.

Comparison of the intensities of atmospheric lines in Table A with the profiles in the Atlas shows that as a rule these lines are stronger on our spectrograms than they were on the Mount Wilson plates from which the Atlas was prepared. Uniform relations between atmospheric lines in Table A and in the Atlas are not to be expected, however, because the profile of a line in the Atlas is from one plate out of a considerable number that were required to cover the long range of spectrum. Relative intensities of atmospheric lines in the Atlas are therefore dependent on the varying conditions of observation, except when lines traced from the same negative are considered. Data for atmospheric lines therefore lack homogeneity both in the Atlas and in our Table A.

6. The Segregation of Atmospheric Lines

The classification of lines as to solar or terrestrial origin has been based on two methods, with some supplementary data from other tests. In the first method, a comparison of spectra from the eastern and western equatorial limbs of the sun provides a distinction between solar lines, which show displacements due to Doppler effect, and telluric lines, which are unmodified. This method is conclusive for isolated lines of suitable intensity, which can be classified by inspection, without the necessity of measuring displacements on our plates.

For lines so weak as to be seen only with difficulty, even micrometer measurements of such limb plates may be insufficient to show whether or not a rotational displacement is present. Another limitation of this method is involved in the change of intensity which affects many solar lines near the limb. A line which is much weakened or which disappears at the limb must originate in the sun, but this fact cannot be established from comparison of limb spectra among themselves.

The second method is based on the comparison of spectra of the central part of the solar disk recorded at different solar zenith distances, or at similar zenith distances on days of high and of low humidity. This method is valuable when light must be economized,

since it avoids the weakening which occurs at the limb. It is applied on the assumption that solar lines will appear alike on the spectrograms compared, but telluric lines will be stronger on one plate than on the other.

This assumption is justified when the atmospheric absorption is not too great, but caution is required in comparing estimated solar intensities at extremely long air path with those at high sun. In some regions of the spectrum, including the visible red and at least part of the infrared, a general weakening of solar lines is observed at low sun. Part of this effect is an illusion which arises from the stronger contrast at which the solar lines are viewed or photographed when intermingled with the more intense atmospheric lines at low sun. In his careful visual work on telluric lines in the solar spectrum, L. Becker [33] noticed this effect and ascribed it to variation of contrast. Other causes may operate to produce the observed appearance of weakening, but beyond remarking that insufficient quantitative data are available, we omit discussion of them. (See notes 11, 31, 32, and 37 to Table A.)

A third means of distinguishing atmospheric from solar lines is the comparison of the spectrum of the disk with that of a sunspot, where an atmospheric line remains unmodified, while the solar lines in general show effects of the thermal and magnetic changes between spot and disk. This method has been useful as a check on the more certain evidence given by the other tests. It is obviously less generally available than the first two methods, and it fails in the spectral region where times of exposure for sunspot spectra become prohibitive.

Since telluric absorption lines are, as a rule, distinctly blacker than solar lines of similar equivalent width, the two types can often be distinguished by mere inspection of a single high-dispersion spectrogram. In the infrared spectrum many solar lines arise from high levels of energy within the atoms. For this reason and also because elements of low atomic weight account here for a considerable number of lines, diffuseness is a characteristic which frequently helps to distinguish solar absorption from that due to the earth's atmosphere. Toward the end of Table A such distinctions as we have been able to make between solar and telluric lines have depended on this method of comparison. But it is important to note that, contrary to the general rule mentioned above, some diffuse telluric absorption lines are found, especially when the sun is observed very near the horizon. These resemble solar lines in appearance, but are distinguished by their restriction to the lowest levels of the terrestrial atmosphere. Since they are best known in the visual region, these peculiar telluric lines will be discussed elsewhere.

Two classes of telluric lines are distinguished in Table A, marked *Atm* and *Atm*O_2 respectively. Lines in the more numerous *Atm* group are mainly, but not necessarily entirely, due to ordinary water vapor. We omit the additional symbol *wv,* even for those lines to which it properly belongs through the results of rotational analysis of H_2O bands. The greater part of the atmospheric lines have not yet been definitely assigned to their places in this system, although their vibrational transitions are generally agreed upon. Among the abundant weak lines it is probable that some are not due to ordinary water. Since the oxygen isotope of mass 18 is one-five-hundredth as abundant as ordinary oxygen, and since deuterium is one-five-thousandth as abundant as H, the observations mentioned in note 12 to Table A show that at least three of the eight isotopic forms of heavy water should be observable with long air paths in the lower atmosphere. These are H_2O^{18}, H_2O^{17}, and HDO^{16}. Their strongest absorption lines should be well measurable with a powerful spectrograph under ordinary conditions of humidity when the air paths are $\geqslant 6$ km, 30 km, and 60 km, respectively. A. Adel [34] has already recognized a band of HDO^{16} beyond the photographic infrared. So far as we know, the three strongest lines of HDO^{16} within the range of Table A are λ10010.44, λ10020.90, and λ10028.30. On our high-sun plates atmospheric absorption is not found at these places. We have no plates at low enough sun to make a significant search for them.*

Lines of water vapor increase in strength with solar (or stellar) zenith distance more rapidly than do the lines of *Atm*O_2, as a result of the difference in vertical distribution of these gases.

Hundreds of weak *Atm* lines that readily appear with very long air path have been omitted from Table A, since they are not present under the conditions ordinarily chosen for observing the solar spectrum, but the list of *Atm*O_2 lines that occur within the limits of Table A is as complete as we have been able to make it with the aid of long air paths, extending to roughly 200 km for some of the bands. Since the data for O_2 lie partly outside the range of the present work and discussion of them is not of immediate astrophysical interest, the results will be published separately. Over 500 lines of O_2 are included in Table A, all of which have been assigned

* Bolograms made at the Table Mountain Station of the Smithsonian Astrophysical Observatory are reported, through the kindness of Dr. Oliver Wulf, to show the occurrence of telluric absorption throughout the region λ9900–λ11000 at very low sun. Whether this absorption is merely the extension of the adjacent bands of ordinary water vapor, or due to some other molecule, has not been ascertained.

to their vibrational and rotational transitions in the appropriate isotopic forms of the molecule. A new member of the $^1\Delta \leftarrow {}^3\Sigma$ system is found near λ10600. Lack of space in Table A necessitated the omission of the rotational quantum numbers for all the *AtmO₂* lines, but space has been taken in the E P column to show for each *AtmO₂* line the isotopic form of the molecule and the vibrational quantum numbers, of which the first applies to the electronically excited state of the molecule.

All *AtmO₂* lines in Table A having wave lengths less than 9000A are associated with the electronic transition $^1\Sigma \leftarrow {}^3\Sigma$ in the molecule, those of greater wave length with $^1\Delta \leftarrow {}^3\Sigma$, the $^3\Sigma$ state being in each case the ground state. It is interesting to note that three bands in the $^1\Sigma \leftarrow {}^3\Sigma$ system of ordinary oxygen appear, for which the vibrational energy is not 0, but 1 unit. These are the 3,1, 2,1, and 1,1 bands near λ6370, λ6950, and λ7700, respectively. For their origins the E P is nearly 0.2 volt.[35]

Except in the ultraviolet and for solar observations near the horizon, telluric absorption bands do not seriously affect the observation of celestial spectra in the region preceding Table A. Atmospheric scattering is, however, often serious in the ultraviolet. In the region of Table A scattering is slight, but intense absorption bands of water vapor and of oxygen occur. The limits of these bands depend greatly on the constantly changing conditions of observation, but the regions of greatest obscuration are roughly indicated in table 8.

TABLE 8

ROUGH LIMITS OF ATMOSPHERIC ABSORPTION BANDS

Limits	Origin
λ6867–λ7050	O_2, H_2O
7165– 7400	H_2O
7594– 7700	O_2
8100– 8400	H_2O
8900– 9900	H_2O
10950–12800	H_2O, O_2
13300–15000	H_2O

7. Intensities of Lines in Sunspot Spectra

The intensities given in Table A for lines in sunspot spectra relate, as far as possible, to umbrae of large spots situated well in from the solar limb. We have tried to exclude the penumbra from most of our spectrograms in order to contrast strongly the spectrum of the coolest part of the umbra with that of the undisturbed central part of the solar disk. An occulting plate at the slit of the concave-grating spectrograph and two interchangeable diaphragms just in front of the plateholder aid in accomplishing this purpose. But a combination of favorable conditions is essential for success, and too often the spectrograms are more representative of the penumbra than of the umbra, even in the infrared, where scattered light is less troublesome than elsewhere and the astronomical seeing is better.

We have utilized a few stigmatic spectrograms, purposely made to show penumbral spectra bordering that of the umbra, to supplement our concave-grating plates.

All the intensities of sunspot lines in Table A are eye estimates, made by comparison with the same lines in the disk, without the use of scale plates and without any control through measurement of equivalent width. Because of the complexity of the spot spectrum, the difficulty of assigning intensities is much greater than in the disk, and the resultant values must be given lower weight. When spectrograms made under various conditions of observation and with different dispersion are compared, conclusions as to the behavior of some lines may be diverse, even to the extent of being contradictory.

The intensities in column 3 of Table A are nevertheless valuable, although they are distinctly secondary to our main purpose, which is to provide a description of the spectrum of the solar disk. The great strengthening, in spots, of numerous metallic lines and the more or less complete obliteration of some lines of ionized elements afford striking evidence of the reduced temperature in sunspots, confirming much earlier work in the visible part of the spectrum.

Apart from true thermal effects, the intensities of atomic lines in sunspot spectra are also subject to modification by the magnetic fields in spots. Consider a hypothetical line in the spectrum of the solar disk, having intensity about 3, equivalent width (W) about 50 milliangstroms, and having also a triplet Zeeman pattern. Suppose the line is observed in the spectrum of a spot so situated that the line of sight is parallel to the magnetic field, which is assumed strong enough to separate completely the two n-components presented to view. The spectral line is further supposed to be unchanged by the reduced temperature of the spot.

If M is the number of atoms which produce the line in the spectrum of the disk, each n-component of the Zeeman pattern observed in the spot is associated with $M/2$ atoms. The solar curve of growth as found by C. W. Allen[36] shows that such a change in M causes W to become $W/2$, and table 4 indicates that the intensity of each n-component is 1. If the field is weakened until the components are largely overlapped, the appearance partially resembles that of the original line in the disk. When the line of sight is nearly parallel to the magnetic

field, circular analysis shows the n-component of either sign weaker than the disk line (under the given conditions), the weakening being more pronounced when the Zeeman pattern is more complex or more nearly resolved. The theory of the inverse Zeeman effect is clearly stated in the work of F. A. Jenkins and H. E. White [37] (p. 425).

Similar treatment shows that a line whose intensity in the disk is 12 would have n-components in the spot each with intensity 11, because the curve of growth slopes little at this intensity. As the field is weakened, the n-components of such a line begin to blend much sooner than do the components of the weaker line first discussed, and the spot line may appear stronger than its counterpart in the disk.

In actual observations of spot spectra the conditions are more complicated than those assumed above. The magnetic field is generally inclined to the line of sight, both its intensity and its direction are to some extent variable along the path of absorption, magnetic patterns are often very complex instead of triple, and the magnetic and thermal effects must be observed together. Lines with complicated Zeeman patterns will have spot intensities dependent on both the relative and the absolute intensities of the components and on the degree of their resolution.

It is not surprising to find in the sunspot spectrum intensities at variance with those to be expected as a consequence of the lower temperature alone, especially in the infrared, where Zeeman patterns are spread out, according to Preston's rule, much more than in the visual region. The increased magnetic resolution thus introduced may weaken a line which, in the absence of the field, would be strengthened in the spot.

Simple generalized statements of the magnetic effects on intensities of spot lines are inadequate to describe the variety of changes actually observed. A thorough discussion of the inverse Zeeman effect for both strong and weak fields would be valuable, especially if made to combine the theoretical treatment by H. A. Lorentz with modern work on curves of growth, turbulence in the solar atmosphere, inclined fields, and similar factors affecting the profiles of absorption lines.

The change of intensity from disk to spot is summarized in table 9 for 399 unblended lines from Table A. For each group of lines the average low E P is given in column 3; column 4 shows the mean of the observed values of ΔI = intensity in disk *minus* intensity in spot. Assuming a linear relation between numbers in columns 3 and 4, a least-squares reduction gives $\Delta I = 1.91(\mathrm{E\,P}) - 7.7$, from which we find that an E P of 4.0 ± 0.2 volts corresponds to $\Delta I = 0$.

Between λ5400 and λ6600 the difference ΔI was taken for 373 unblended lines of medium and low intensity. Average values are shown in the right-hand part of table 9, where each group includes various elements. Constants for the green-red data were found graphically. They show that $\Delta I = 0$ when E P=3.9 volts, in agreement with the infrared. The original data for this visual region were obtained by one of us [38] from spectrograms unlike most of those used for our infrared studies.

The most interesting departures from the relations shown in table 9 are found, in the infrared, for a few lines of *H, N, O, Mg* II, and one line each of *Ca* and *Na*.

TABLE 9

DISK INTENSITY *minus* SPOT INTENSITY (ΔI) AND LOW E P

	λ6600–λ11000			λ5400–λ6600		
Element	No. lines	$\overline{\mathrm{E\,P}}$	$\overline{\Delta I}$	No. lines	$\overline{\mathrm{E\,P}}$	$\overline{\Delta I}$
V......	11...	1.21	−5.0	40...	0.14	−5.4
Ti......	28...	1.28	−6.4	53...	1.01	−3.5
	58...	1.82	−5.0	19...	1.43	−2.6
Fe......	41...	2.74	−1.6	41...	1.82	−1.9
	50...	2.93	−1.5	66...	2.34	−1.9
	22...	3.80	0	54...	3.46	−0.8
	33...	4.49	+1.5	87...	4.32	+0.4
	59...	4.83	+0.4	14...	5.12	+1.9
Cr......	12...	2.95	−3.1			
Ni......	17...	2.97	−1.0			
	11...	4.17	+1.2			
Mg......	6...	5.62	+2.0			
Si......	27...	5.65	+2.4			
S......	10...	7.38	+5.4			
C......	14...	7.47	+7.9			
$\Delta I = 1.91(\mathrm{E\,P}) - 7.7$				$\Delta I = 1.29(\mathrm{E\,P}) - 5.1$		

Remarks on the behavior of *H* are given in note 20 to Table A. Observed values of ΔI for the other elements mentioned above fall below the positions computed for them by the equation. In the visual region 23 lines of *Sc* II, *Fe* II, and similar spectra have values of ΔI which average 3.5 intensity units above those computed from the appropriate equation.

The number, M, of atoms in a given state of excitation E has been expressed by H. N. Russell [39] as

$$\log M = \log A + \log W - \frac{5040E \times 0.85}{T}$$

where A is a factor representing atomic abundance, W is the statistical weight of the given state, and 0.85 is a correction factor which he derived to allow for the de-

parture of the solar atmosphere from thermodynamic equilibrium. Writing a similar equation for the sunspot spectrum and subtracting, we have

$$\log M_D - \log M_S = \log A_D - \log A_S + 5040E \cdot 0.85 \left\{\frac{1}{T_S} - \frac{1}{T_D}\right\}$$

where subscripts D and S distinguish the disk and spot values. W has disappeared, since we are concerned here only with change of intensity of each spectrum line in passing from disk to spot. From table 9, the left-hand side of this equation becomes 0 when $E=4$ volts. If $T_D=5750°$ and $T_S=4700°$, $\log A_S - \log A_D = 0.67$, that is, the neutral atoms are about five times as abundant in a sunspot as in the normal solar atmosphere, a result attributable to diminished ionization at the lower temperature of the spot.

8. Identification of Solar Lines

By photographing the arc spectra of the elements one by one in registration with that of the sun on the same plate, Rowland established the origin of thousands of solar lines. The favorable dispersion and resolving power of his gratings and the use of the purest chemicals available facilitated his work. But, since he employed no corrections to allow for the velocity of the spectrograph relative to the sun, the limits of coincidence (discussed in section 3 above) must have been appreciably wider in his work than they now are.

Later applications of Rowland's method have omitted the direct photographic comparison of solar and laboratory spectra and have involved a search for coincidences between published solar wave lengths and separately measured laboratory values. Perhaps the most extensive study of this kind was that made by F. E. Baxandall, who showed the probable occurrence in the sun of a few elements not found by Rowland. Baxandall generously made available to workers at Mount Wilson a summary of his unpublished results when the RR was in preparation there. He had utilized much laboratory material which had accumulated after Rowland's death and had been collected by Professor H. Kayser.

Although the Rowland method is basically statistical, it has usually been applied with an unknown factor of judgment controlling the allowed departure from exact coincidence. With the growth of the quantum theory and the analysis of spectra, new tools have been provided for interpreting the solar spectrum. The first extensive application of the new method was made by one of the writers (C. E. M.) in the RR. In the present work she has carried on advantageously the preparation of her *Revised Multiplet Table* [40] (RMT) and the identification of solar lines at the same time. These projects have supplemented each other because the solar wave lengths provide a very homogeneous body of data, and also because in the solar atmosphere spectra like that of *Fe* I are more richly developed than in any artificial source of light.

Because of uncertainties in laboratory wave lengths, fixed limits cannot be assigned within which the coincidence of a solar and a laboratory line can be considered established. But though judgment must still be exercised in accepting or rejecting suggested coincidences, it is now less intuitive than formerly, and is controlled by tested principles. The observer now compares an unknown solar line with other solar lines, as well as with known laboratory lines in its near vicinity. If the line in question fits into a pattern (multiplet) of other solar lines, both as to its wave length and as to its intensity, it may often be confidently assigned to the same atom, even though the laboratory data appear to exclude it. Relative intensities of whole multiplets within a spectrum have also to be considered.

The unit character of multiplets,[41] the observed or computed relative intensities of members of a multiplet, and the general correspondence between E P and change of intensity from disk to spot are guiding principles. Weak members of a multiplet cannot be considered present in the sun unless the stronger members are either recognized or accounted for by obscuration. The character of the line, whether sharp or diffuse, is a further aid in fixing its identity, diffuseness being associated with low atomic weight or high E P or both.

Unclassified atomic lines will sometimes be found identified in Table A, where they are distinguished by the absence of the E P. As a rule such identifications have been made conservatively.

Some solar lines are identified with more than one atomic transition, as when lines of different elements are nearly coincident. Occasionally two distinct transitions occur in the same atom, giving lines essentially coincident. In such cases the component of shorter wave length is stated first. In a blend of two or more lines, that component which is thought to contribute the most is underlined.

Predicted lines of *Fe* I have been discussed in section 3. A smaller number of such lines in other spectra have been identified in column 4 of Table A, where their chemical symbols are followed by *p*. This letter designates all identified lines that have not been observed in laboratory sources. Predicted wave lengths, when based

on term values derived from well measured solar lines, rather than on laboratory data alone, are especially valuable in the identification of solar lines, such as certain lines of *Si* and *C*.

In addition to the solar identifications given in Table A, C. E. Moore has completed similar work throughout the region of shorter solar wave lengths. In a forthcoming paper we expect to publish such of these as apply to wave lengths shorter than 3060A, along with new wave lengths and intensities.

It will be evident that the identifications in Table A are by no means the undeniable product of arithmetical operations; but the improved method, the extensive data available, and the experience gained in earlier work make the results in column 4 as nearly definitive, we believe, as our present knowledge permits. Further laboratory observations in the infrared region are still needed for many elements.

Most of the elements can be recognized in the sun by lines of wave length less than 6600A, but solar lines of *Rb, P, Li,* and *N* are now known only within the limits of Table A. Lines due to *O, S, Si,* and *C* are more prominent in the infrared than elsewhere; the last two stand next to *H* and *Ca* II in the strength of their individual lines. *He* is always present at λ10830.38, but with variable intensity. Further comments on *H* and *He* are given in notes 20 and 53 to Table A. In section 13 the list of elements identified in the sun is given, as of 1947.

NOTE ADDED IN PROOF: Through the kind permission of Dr. I. S. Bowen we are able to add a recent observation of considerable interest. In a forthcoming article on "The Abundance of Oxygen in the Sun," Dr. Bowen finds plausible evidence for three lines of [*O* I] in the solar spectrum, and computes the equivalent widths for a few forbidden lines of some other abundant elements. Among these last, the most likely to be observable is [*Si* I] λ10991.52. Near this position our Table A shows a group of atmospheric lines. On a recent spectrogram of east and west equatorial limbs we now find a weak diffuse solar line corresponding so nearly in position and character to the expected [*Si*] that there can be little doubt of the identity.

The identification of compounds in the sun by means of their band spectra has been discussed by H. D. Babcock.[42] In note 40 to Table A a list of identified band heads, within the limits of the present work, is given. The most interesting new feature here is the occurrence of the red system of *CN* bands.

Of slightly over 7400 lines in Table A, 51 per cent are either wholly or partly due to atmospheric absorption; for 11 per cent it is not known whether they are atmospheric or solar; and 38 per cent are either certainly or probably of solar origin. In this last group, well over one-half are identified with the atoms or molecules which produce them; less than 1300 solar lines (some of which may eventually prove to be atmospheric) remain unidentified.

Solar lines of intensity 2 or greater that remain unidentified are listed in table 10.

TABLE 10

UNIDENTIFIED SOLAR LINES IN TABLE A

λ	Intensity		λ	Intensity	
	Disk	Spot		Disk	Spot
6771.12.....	2	3w*	9994.94.....	2N	3N
7012.612....	2Nl	ob	9997.665....	2	ob?
7055.927....	2N	ob?	9999.21.....	2N	2N
7247.07.....	1N	2	10123.895†...	8	4
7282.844....	3N	2N	10297.64.....	−2	2
7435.584....	2	−1N	10406.98.....	2N	0N?
7567.170....	2NN	1NN	10501.549....	2	ob
7659.91.....	3	ob	10535.702....	2N	1N
7669.668....	2	1	10611.669....	3	2
8054.311....	5N	6N	10620.91.....	0N	2N
8215.155....	2N	0N	10868.82.....	2	0
8248.802....	4	1	10909.20.....	1	2
8310.252....	2	....	10950.06.....	2	−2
8686.368....	2	−3	10953.36.....	1	3
8712.701....	2	−2	11034.80.....	0N	2
8780.757....	2	ob	11048.44.....	1N	3
8849.96.....	......	2	11448.90.....	5N	
8932.97.....	......	2	11458.89.....	2n	
9737.86.....	1	2	11475.88.....	2	
9888.00.....	1	2	11481.50.....	−1N	2
9890.67.....	3ns	−3	11489.58.....	−1N	2N
9931.45.....	3ns	ob	11508.00.....	3N	4N
9941.46.....	2N	4N?	11839.00.....	2N	
9986.490....	3	0	11876.32.....	10NN	
9988.96.....	0	2	12144.98.....	3N	
			12635.36.....	3NN	

*Blend. †*He* II??

9. EXCITATION POTENTIALS

Next to the abundance of an element, the excitation potential is the most significant factor governing the appearance of its spectral lines in a stellar atmosphere, as H. N. Russell[39] and C. E. St. John[43] have observed. In contrast with lines in the region of shorter wave lengths, most infrared solar lines result from transitions among terms of high energy level; ultimate lines are rare, and there is a dearth of penultimate lines. Strong absorption by *H, C,* and *Si* is here associated with high E P; the great triad of *Ca* II arises from a low metastable state.

The data in column 5 of Table A are taken from the RMT, where, for stated reasons, a value 12345×10^{-8} cm was used for the constant λ_0, the wave length associated with one absolute volt. This figure expresses the ratio hc^2/e in terms of values for the fundamental constants that were accepted twenty-five years ago (h = Planck constant, c = velocity of light, e = charge on the electron). Extensive later investigations of the basic constants have been thoroughly discussed by R. T. Birge [44] in his treatment of the values of the constants and their combinations. The resulting authoritative value of λ_0 is $(12395 \pm 2) \times 10^{-8}$ cm. The small probable error, derived by Birge, shows that the later value of λ_0 has little probability of further important modification. In any application of the E P in Table A, therefore, our tabulated numbers should be increased by 4 parts in 1000, if such an accuracy is significant.

In table 11 are collected the highest values of the lower E P observed in the spectrum of the solar disk for 23 neutral and 11 ionized elements. Data for E P and I P are from the RMT (or recent additions), wave lengths and intensities are from Table A, the RR, or our unpublished work. The final column gives the ratio low E P/I P.

Other factors being the same, the maximum low E P observable in the solar spectrum would probably be greater in a spectrum which has been fully observed and analyzed than in one less completely known. Despite a vast amount of labor and the resultant growth of knowledge, very few spectra are in fact completely investigated. For example, that of *Fe* I has probably received more study than any other rich spectrum, but hundreds of its weak lines have not yet been recorded in the laboratory although they occur in the solar spectrum. See section 2 above. Lists of such predicted lines are less complete for spectra of other elements. It follows that the maximum values of lower E P in table 11 may be somewhat lower than those that would have been found with the aid of comprehensive knowledge of all the spectra examined.

The few lines of strong or medium intensity in table 11 are associated with abundant elements; most of the intensities are low, as might be expected. *Cu* and *Cr* II, however, are represented in this table by lines of intensity 2, possibly for reasons suggested in the preceding paragraph.

Values of E P and I P for neutral atoms in table 11 appear to be correlated, but the greater atomic abundance of the light elements, for which ionization potentials are greatest, is probably responsible for the magnitude of their maximum observed low E P. The quantitative analysis of the solar atmosphere is still incomplete, but the outstanding abundance of *H, He, C, N, O, Mg,* and *Si* is generally accepted, with *H* and *He* roughly 1000-fold greater than the other five elements. Among ionized elements, the last four in the table are probably several hundred-fold more abundant, on the average, than those preceding them. If to each tabular E P of an ion the I P of the corresponding neutral atom is added, the total excitation thus obtained shows nearly the same apparent correlation with the second I P as that mentioned above for neutral atoms. The abundance factor is probably determinative, however, throughout table 11.

TABLE 11

MAXIMUM OBSERVED LOW E P FOR SOLAR DISK SPECTRUM

Element	λ	Intensity	E P	I P	E P/I P
		NEUTRAL ELEMENTS			
Y	6845.24	−3	2.36	6.5	0.36
Sc	5258.35	−3	2.50	6.7	0.37
Sr	6550.27	−1	2.68	5.67	0.47
V	5786.163	−2	2.72	6.76	0.40
Na	12679.19	1N	3.60	5.12	0.70
Cu	8092.640	2	3.80	7.69	0.49
Al	8841.23	−1N	4.07	5.96	0.68
Ti	5341.485	−2	4.31	6.81	0.63
Mn	7326.456	0N	4.42	7.40	0.60
Ca	10879.76	−3	4.86	6.09	0.80
Co	8819.16	−2	5.13	7.84	0.65
Ni	7220.786	−2	5.34	7.61	0.70
Fe	11392.64	−1	5.75	7.86	0.73
Cr	7908.14	−3N	5.60	6.74	0.83
Mg	8346.13	9N	5.92	7.61	0.78
Si	8898.99	1	6.20	8.11	0.77
P	9903.69	−3N	7.14	10.9	0.66
S	8884.24	−1	8.38	10.31	0.81
C	12614.20	4N	8.81	11.20	0.79
O	9265.96	2N	10.69	13.56	0.79
N	10113.28	−2	11.71	14.49	0.81
H	12818.23	20	12.04	13.54	0.89
He	10830.38	5N	19.73	24.48	0.81
		IONIZED ELEMENTS			
Sr II	3464.475	1	3.03	10.98	0.28
Y II	3053.248	−3	3.53	12.3	0.29
Sc II	3040.022	−2N	3.99	12.8	0.31
Ti II	2954.78	wk	4.29	13.6	0.31
V II	5241.184	−3	4.50	14.1	0.32
Cr II	3044.230	2N	4.92	16.6	0.30
Mn II	3046.268	0N	5.38	15.16	0.34
Fe II	7334.62	−3	7.24	16.16	0.45
Ca II	5021.153	−3	7.48	11.82	0.63
Mg II	7877.13	0	9.95	14.97	0.67
Si II	5978.919	−2N	10.03	16.27	0.67

10. Fraction of Background Radiation Removed by Solar Absorption Lines

The total absorption of photospheric radiation by the dark solar lines has been derived for five sections of the spectrum by summing the equivalent widths with the aid of table 4. For each section, counts were made of all lines in each intensity class that were known to be either solar or atmospheric. Other lines (all weak), whose assignment to the solar or to the atmospheric group could not be determined, were also counted and proportioned in the same ratio as those of known assignment. In this way a small correction was made to the solar counts.

Equivalent widths of solar lines with intensity less than 0 do not appear in table 4 because their measurements are influenced by systematic errors. From a graph of the calibration given in table 4 we estimate that equivalent widths of 9, 3, and 1.5 mA, respectively, correspond to intensities −1, −2, and −3. Fortunately, such estimates may be appreciably in error without greatly affecting the final results, which are given in table 12.

On the average, the solar lines between λ6600 and λ8100 trap about 1.5 per cent of the background radiation. G. F. W. Mulders [45] reached a similar result for this spectral region even though a critical classification of the infrared lines as to their solar or terrestrial origin, like that of Table A, had not been completed. This incomplete classification may account for the low value (0.6 per cent) found by Mulders at λ7200, where we obtain 1.82 per cent.

TABLE 12

Fraction of photospheric radiation absorbed by solar lines

Region	Range	Total absorption	Per cent absorption
λ6600–λ6700..	100A	1.183A	1.18
6700– 6867..	167	2.414	1.44
7126– 7333..	207	3.759	1.82
7400– 7590..	190	3.690	1.94
7800– 8090..	290	3.484	1.20
			Mean 1.52

11. Comparison of Table A with the Utrecht Photometric Atlas

It will be recalled that the Atlas was made from spectrograms obtained with the 150-foot tower telescope on Mount Wilson, and that Table A contains chiefly the results of observations made in Pasadena, combined with some data from the instruments on the mountain. As would be expected, the Atlas shows less telluric absorption than does Table A. In general the details of the solar spectrum, apart from atmospheric lines, are in excellent agreement in these independent descriptions. As the authors of the Atlas point out, the resolution of very close pairs of lines is better shown by visual examination of the spectrograms than by the registered curves. Separate wave lengths are often given in Table A for members of pairs which cannot be well measured in the Atlas. The occurrence of systematic errors in profiles of very weak lines was also pointed out by those authors, and is indicated by our measurements of equivalent width. Slight effects of lag in the galvanometer are shown in parts of the Atlas, and these, with some other instrumental effects, may account for slight imperfections in this remarkably accurate record.

The following comparisons of data from the Atlas and from Table A appear interesting, but they may not be conclusive. Between λ6676 and λ6820 Table A contains 27 very faint solar lines which are either missing from the Atlas or so feebly indicated as not to be called real lines unless otherwise verified. Near λ8600 a very few faint solar lines are found in Table A but not definitely shown in the Atlas. On the other hand, our plates have not shown a faint line at λ8622.05 that looks real in the Atlas.

A second-order solar spectrogram was made with the 75-foot spectrograph at the Hale Laboratory on a contrasty emulsion, processed to optimum density for visual observation of weak lines. Near λ5390 the wave lengths of 44 very faint lines were determined well enough to justify a search for them in the Atlas, which fails to show 6 of them, but does show 2 not found on our plate.

Tests of a more definitive nature could be devised for comparing the registering microphotometer and the eye, but we leave the topic, remarking again that the intensities of some weak solar lines may not be constant.

12. Comparison of Infrared Solar Data with the Spectra of Some Other Stars

In comparing tables of stellar data with Table A it is important to keep in mind the magnitude, in angstroms, of any velocity displacement that may have been present on the spectrograms from which the stellar wave lengths were derived. Obviously, such displacements may sometimes fully reveal in a star a line which in the solar spec-

trum is obscured by telluric absorption, and vice versa. Unless attention is given to such details, the effects of telluric absorption in a stellar spectrum may appear to be inconsistent with the data in Table A, when in reality they are accordant within limits determined by the conditions of observation.

When stellar intensities are stated on an arbitrary scale, only relative values among them may be significantly compared with like quantities from the spectrum of the sun or of another star, unless the scales are alike.

We are indebted to Dr. W. S. Adams for unpublished results on the spectrum of δ Ophiuchi (spectrum M0, dispersion 5 A/mm) obtained with the 100-inch telescope. From this rich spectrum his estimated intensities of 115 well identified lines are selected for comparison with Table A. Sixteen elements, with atomic numbers ranging from 8 to 40, are included in this comparison, for which the spectral limits are λ7574 and λ8736. Although molecular spectra are prominent in δ Ophiuchi, the chosen lines are probably not seriously affected by blending, and, as will appear, Adams' intensities are given on a scale closely resembling that of Rowland.

TABLE 13

EXCITATION POTENTIAL AND INTENSITY IN δ OPHIUCHI AND IN THE SUN, λ7574 TO λ8736

No. lines	E P (volts)		Mean intensity			Slope, $\frac{\text{spot int.}}{\text{int. in star}}$
	Range	Mean	δ Oph	Spot	Disk	
22....	0 –1.50	0.84	13.7	5.9	0.5	0.4
46....	1.51–3.75	2.61	7.2	4.9	2.6	0.8
47....	3.76–9.48	4.95	3.8	4.0	5.0	2.0

We arrange the lines in three groups according to their excitation potentials, as in table 13, where the columns are self-explanatory except the last. For each group of lines the individual intensities in δ Ophiuchi were taken as abscissae, those from sunspot spectra as ordinates, to form a correlation curve. Although the dispersion of the points is considerable, a real correlation is evident, which is best represented in each group by a straight line. Slopes of such lines (final column, table 13) are nearly proportional to the average E P, and by interpolation show that Adams' intensities in δ Ophiuchi are statistically equal to those of the same lines in sunspots when the E P is about 2.6 volts. Such a result appears accordant with the spectral type of δ Ophiuchi. It has more significance than is given by the direct comparison of the tabulated mean intensities, because the average values naturally conceal the details of the quantities averaged.

Unpublished data on the spectrum of β Pegasi (dispersion 5 A/mm, type M2) have kindly been made available by Dr. Dorothy Locanthi. The spectrograms studied by her were obtained with the 100-inch telescope by Dr. W. S. Adams. Although strong absorption bands due to *TiO* extend through much of this spectrum, many atomic lines are well identified. The intensities estimated by Mrs. Locanthi are expressed on an open scale in which −3 represents a line barely discernible and 85 is assigned to λ8542 of *Ca* II. From 183 lines (λ6600–λ8838) of *Fe, Ti, Ni, V,* and *Si* we find a linear relation between the estimated intensity and the low E P, such that $I = -7.2(\text{E P}) + 39$, i.e., lines of low E P are here developed in great strength. Interesting exceptions to the general rule occur among some lines of *Si, Mg, Zr,* and *Ti.*

TABLE 14

EXCITATION POTENTIAL AND INTENSITY FOR LINES OF *Fe*, IN THE SUN AND IN β PEGASI

No. lines	Mean E P (volts)	Mean intensity		
		Disk	Spot	β Pegasi
24.........	1.45	2	6	28
15.........	4.22	4.6	4.7	11

A further illustration of the prominence of lines of low E P, taken from the behavior of 39 lines of *Fe,* is shown in table 14. Although direct comparison of these solar and stellar intensities requires evaluation of the unit used by Mrs. Locanthi, table 14 shows that, if her scale is logarithmic like ours, the lines of low E P are much stronger in β Pegasi relative to those of high E P than they are in the sunspot spectrum.

J. L. Greenstein and P. W. Merrill [46] have studied the infrared spectrum of υ Sagittarii (spectrum cApe) with a dispersion of 20 A/mm. From table 1 of their paper data for *H, N* I, *O* I, *Si* I, *Fe* II, and *Mg* II are selected for comparison in table 15 with intensities of the same lines in the spectrum of the solar disk.

It is evident that, among these selected lines, *O* I and *Si* I are stronger in the sun, relative to *N* I, than they are in υ Sagittarii. For *Fe* II and *Mg* II the intensities are similar to those of *N* I in both spectra. The three *H* lines are weaker, relative to *N* I, in υ Sagittarii than in the sun.

ns — means that a line is slightly nebulous on the shorter wave length side.

N — shows that the line is nebulous. This is not to be confused with *N* in the element column, where the meaning is obvious.

NN — characterizes lines that are exceptionally nebulous.

ob — means that the line is obliterated, as for certain lines in the spot spectrum.

tr — is occasionally used to designate unresolved triple lines.

w — indicates that the line is widened—a condition often observed in spot spectra when field strength and resolving power are insufficient to separate the Zeeman components.

( ) — atmospheric lines of intensity 20 or more are enclosed in parentheses because they are expressed on a special scale, as explained in section 5.

blank — lines measured only in the spot spectrum are given no intensity in the disk, being either absent or indeterminate there.

Element

Fe, etc. — chemical symbols are used to designate elements and compounds in their neutral states. Spectra of singly ionized elements are distinguished by the additional symbol II.

⊙ — denotes a line originating in the sun, but not yet identified as to chemical origin.

blank — a blank in the element column means that we do not know whether the line is solar or telluric.

— — accompanying a chemical symbol in the element column, a dash indicates the presence of an additional component of unknown chemical origin.

( ) — the chemical symbol of a masked line is in parentheses.

underline — the chemical symbol of a dominant component in a blend is underlined.

? — any datum in Table A for which the evidence seems not conclusive is followed by a question mark, which qualifies only the one symbol immediately preceding it.

p — the chemical symbol of an element for which no line has been observed in the laboratory is followed by p to indicate that the combination principle predicts such a line. See section 8.

Atm — atmospheric. Within the range of Table A atmospheric absorption with resolvable fine structure is associated with water vapor and oxygen. Ozone has numerous diffuse bands in this range, but they are not known to show structure. Lines of atmospheric oxygen are designated $AtmO_2$. Other known telluric lines are marked *Atm.* See section 6.

Excitation Potential

E P — this abbreviation is often used in the text, and is to be associated with the lower of the two potentials involved, unless the contrary is stated.

$\left.\begin{array}{l}16\text{-}16\\16\text{-}17\\16\text{-}18\end{array}\right\}$ — for lines of atmospheric oxygen, space is taken in the E P column to show which of the three isotopic forms of oxygen is the origin of the line.

Definitions

Blend — a superposition of two or more lines, so compact that only one wave length can be obtained.

Core — lines of very great intensity often exhibit a comparatively narrow and very dark central region which may be distinguished from the wings and is known as the core.

Mask — a weak component in a blend is said to be masked when no evidence of its presence is discerned, but multiplet relations point to its occurrence.

Longward — in the direction of longer wave length.

Shortward — in the direction of shorter wave length.

Wings — are wide lateral extensions of very strong lines. In the sun they are usually symmetrical and structureless, and merge smoothly and gradually into the continuous background, except as broken by narrow absorption lines of independent origin.

RR — the Mount Wilson Revision of Rowland's Table. See no. 16 in bibliography.

RMT — the Revised Multiplet Table. See no. 40 in bibliography.

TABLE A

INFRARED SOLAR SPECTRUM

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
6600.40	-3		Atm?			1
6600.81	-3		Atm?			1
6601.14	-3		Fe p	4.97	6.84	1
6601.48	-3		⊙?			
6601.98	-1		Atm			
6602.134R	-1		Atm			
6602.45	-3		Atm?			
6603.25	-3		Fe?p	3.63	5.49	1 2
6603.43	-3		Atm			1
6603.65	-3		Fe p	3.62	5.49	1
6604.40	-3					1
6604.600R	2	1	ScII	1.35	3.22	
6605.08	-3		Atm			1
6605.574R	-1	1	Cr-	4.13	5.99	
6605.924R	-2NN	3	V	1.19	3.06	
6606.75	-3		⊙?			1
6606.979R	-1	ob	TiII p	2.05	3.92	
6607.350R	-3		⊙			
6607.90		-1	V?	1.34	3.21	1
6608.044R	1	2	Fe	2.27	4.14	
6609.118S	5	6	Fe	2.55	4.42	30
6609.582R	-1	ON	Fe			
6609.693R	-2	-1	Fe p	0.99	2.85	
6610.079R	-3		⊙			
6610.754R	-3		Atm			
6611.376R	-3		⊙?			
6611.96	-3		Atm			1
6612.237R	-3	-2	Cr	4.14	6.01	24
6612.553R	-3d		Atm			
6612.98	-3NN		Atm?			1
6613.420	0	-1	⊙			
6613.73	ON	-2N	YII	1.74	3.61	21
6613.83	ONN	2	Fe p-	1.01	2.87	21
6614.13	-3		Atm?			1
6614.71	-3		Atm?			1
6615.01	-3		Fe p	4.45	6.32	1
6615.63	-3		⊙?			1
6616.20	-3		⊙?			1
6616.83	-3		⊙?			1 2
6617.14	-3		Atm?			1
			Co?	4.46	6.32	
6617.27		-1	Sr	2.24	4.11	
6617.60	-3		⊙?			1
6617.743R	-3		⊙?			
6618.349R	-3		⊙?			
6619.12	-3		Atm?			1
6619.588R	-3		⊙?			
6621.11		2				1,54
6621.204R	-3		Ni	3.58	5.45	
6622.402R	-3		Fe p	4.37	6.23	
6622.94	-3		Atm?			1
6623.32	-3		Atm?			1
6623.82	-3		Fe p	4.06	5.92	1
6623.924R	-3		⊙?			
6624.368R	-3		⊙?			
6624.840R	-3N	1	V	1.21	3.08	
6625.039R	1	3	Fe	1.01	2.87	
6626.267R	-2		Atm?			
6626.43	-3		Atm?			1
6627.32	-3		FeII	7.24	9.10	1
6627.560R	2	0	Fe	4.53	6.39	
6628.165R	-2NN		Atm?			
6628.973R	-2NN		⊙ Atm?			
6629.390R	-3		Atm			
6629.686R	-3		⊙			
6630.032R	-1	4	Cr	1.03	2.89	
6631.087R	-3		⊙			
6631.773R	-3		Atm?			
6632.029R	-3		⊙			
6632.472R	-1	-1	Co	2.27	4.13	
6632.73	-3		⊙?			1
6633.14	-3		Atm?			1
6633.427R	0	-1	Fe	4.81	6.67	
6633.758R	4	3	Fe	4.54	6.40	
6634.123R	1	0	Fe	4.77	6.64	
6634.59	-3N		⊙?			1
6634.763R	-3		Atm?			
6635.137R	1	0	Ni	4.40	6.26	
6635.398R	-3		⊙?			
6635.702R	-1	-3	Fe p	4.42	6.28	
6636.332R	-3		Cr	4.13	5.99	
6637.24		0	⊙			1,54
6638.076R	-3		⊙			8
6639.267	-3		Atm?			
6639.40	-3NN		Fe?p	4.89	6.75	1
6639.717R	1	0	Fe p	4.59	6.45	
6639.897	0	1	Fe p	4.06	5.92	
6640.45	-3		Atm?			1
6640.89	-3N		Atm?			1
6642.272R	-3N		Atm?			
6642.53	-3		Atm?			1
6643.00	-3		Cr	3.83	5.69	1 2
6643.40	-3		Atm?			1
6643.638S	6	8	Ni	1.67	3.53	
6643.864R	-3		⊙?			
6644.282R	-3N		⊙			
6645.127R	-2d		EuII	1.37	3.23	
6646.071R	-3d?		Atm?			
6646.20		-1	⊙			
6646.58	-3		Atm?			1
6646.966R	0	1	Fe	2.60	4.45	
			(Fe)	4.42	6.27	
6647.856R	-3		Fe p	3.23	5.08	
6648.121R	-1	1W	Fe p	1.01	2.86	
6648.691R	-3		Atm			
6649.20	-3NN		⊙			1
6649.51		0	⊙			1,54
6650.60	-3		Atm			1
6651.132R	-3		⊙			
6652.361R	-3		⊙			
6652.976R	-3		⊙			
6653.67	-3		⊙			1
6653.911R	0	-1	Fe	4.14	5.99	
6654.60	-3		Atm			1
6655.531R	-2		Atm ⊙			
6656.36	-3		⊙			
6656.65	-3		⊙			1
6656.82	-3		Atm			3

I A	Intensity Disk	Intensity Spot	Ident	E P or Band Data		Notes
6657.43	-3		Atm?			1
6657.639R	-3		Cr?	4.14	5.99	
6657.95	-3		Atm?			1
6658.54	-3N		Atm?			1
6658.925R	-3		⊙?			
6659.55	-3		Atm			1
6659.866R	-2	ob?	⊙			
6660.32)	-3		Atm?			1,24
6660.78)	-3		Atm?			2 1
6661.081R	0	1	Cr	4.17	6.03	
6661.341R	-1	-2	Ni?	4.22	6.07	
6661.772R	-3		Atm?			
6662.580R	-3		⊙?			
6663.01	-3		⊙?			1
6663.246R	1	-1	Fe	4.54	6.39	
6663.448	6	8	Fe	2.41	4.27	
6663.790R	-3					
6664.310R	-2		⊙?			
6665.06)	-2N					1
6665.27)	-3N		⊙			2 1
6665.39	-3		Fe	4.37	6.22	1
6665.47		0	Fe p	1.55	3.40	1
6665.83	-3d?		Atm?			
6666.540R	-3	0	Ti	1.45	3.31	
6666.73	-3		Atm?			
6667.23	-3		Fe?p	2.41	4.26	
6667.455R	-3	-2	Fe	2.44	4.29	
6667.740R	-2	-1	Fe	4.56	6.42	
6668.400R	-3	-1	⊙			
6668.801R	-3		⊙			
6669.310R	-2	-2	Cr	4.16	6.01	
6669.66	-3		Atm			
6669.97	-3		Atm			
6670.34	-3		Atm			1
6671.09	-3		Atm?			
6671.82	-3d?		⊙?			
6672.675R	-3		⊙			
6673.50	-3		Atm?			
6673.88	-3		Fe p	4.71	6.56	
6674.19	-3		⊙			
6675.44	-3		Atm			1
6676.89	-3		Fe p	4.54	6.39	
6677.24	-3	0	Ti	2.48	4.33	1
6677.54	-3		Fe p	(3.20	5.05	1
				(4.99	6.84	
6677.997S	8	9	Fe	2.68	4.53	
6678.576R	-3	-1	Ti p	2.24	4.09	
6678.849R	-2		Co	1.95	3.80	
6679.58	-3NN	1	⊙			1,40,54
6680.155R	-1N	-2N	Cr	4.14	5.99	
6680.623R	-3d?		Atm?			
6681.30	-3		Fe p	4.37	6.21	1
6682.24	-3		Fe p	4.06	5.91	1
6682.78	-3					1
6683.32	-3		Atm			1
6683.69	-3		Atm?			1
6684.05	-3		Atm			1
6684.890R)	-3		⊙			
6685.04)	-3		⊙			1,40
6685.66	-3		Atm?			1
6686.21	-3		Atm?			
6686.84	-3		Atm?			1
6687.508R	-2	1	Y	0.00	1.85	
6687.74)	-3		⊙?			1
6687.96)	-3		⊙?			1
6688.90	-3		Atm			1
6689.30	-3		⊙?			1
6690.38	-3		Atm?			1
6690.61	-3		⊙?			1
6690.825R	-2		Ni	3.62	5.46	
6691.61	-3N		⊙			
6692.304R	-3		⊙			
6692.856R	-3		⊙			
6693.48	-3		Atm?			1
6694.00	-3		Atm?			1
6694.62	-3		Atm?			1
6695.643R	-3N		Atm			
6696.032R	2	4	Al	3.13	4.97	
6696.322R	0	-2	Fe p	4.81	6.66	
6696.69	-3		⊙?			1
6696.827R	-3		⊙?			
6697.406R	-2N		⊙			
6698.00	-3		⊙			1,3
6698.669R	1	3	Al	3.13	4.97	
6699.136R	0	0	Fe	4.57	6.42	
6700.52	-3NN		⊙			1
6700.919R	-3		Ni	4.25	6.09	
			Fe p	(4.45	6.30	
				(5.05	6.89	
6701.377R	-3		⊙			
6701.74	-3		⊙?			1
6702.05	-3		Atm?			1
6702.55	-3		⊙?			1
6703.27	-3		⊙?			1
6703.576R	2	3	Fe	2.75	4.59	
6704.041R	-3		⊙			
6704.500R	-2	-1	Fe	4.20	6.04	24
6705.105	2	1	Fe	(4.59	6.43	
				(4.93	6.77)	
6705.507R	-3		⊙?			
6706.75	-3		⊙			1
6707.05	-3		⊙			1
6707.449R	-2	-1?	⊙			24
6707.76)	-3	3	Li	0.00	1.84	1
6707.98)	-3	1N	Li	0.00	1.84	1
6708.14	-3		Atm?			1
6708.32	-3		⊙			1
6708.80	ONN	ONN	⊙			1,24
6708.980	-3NN	ob.	⊙			
6709.64	-3		Atm?			1
6709.87		-1	Ca	2.92	4.76	1
6709.935R	-3					
6710.323R	1	2	Fe	1.48	3.32	
6710.542R	-3		⊙			
6711.282R	-3		Fe?p	4.56	6.40	

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	E P Data	Notes
6711.58	-3		⊙			1
6711.847R	-3		⊙			
6712.467R	-3		Fe p	4.97	6.81	
6713.044R	1	ob	Fe	4.59	6.43	24
6713.207R	-1	1	Fe	4.12	5.96	24
6713.745R	1	-1	Fe	4.77	6.61	
6714.25	-3N		Atm			1
6714.80	-3N		Atm			1
6715.386R	2	2	Fe	4.59	6.43	
			(Cr)	4.16	5.99	
6716.252R	1	-2	Fe	4.56	6.40	
6716.666R	-3	0	Ti	2.48	4.31	
6717.00	-3		⊙			1
6717.527R	0N	ob?	Fe	4.59	6.42	
6717.687S	6	8	Ca	2.70	4.53	
6719.62	0N	1N	⊙			8
6720.77	-2N		⊙			
6721.46	-3		⊙?			1
6721.844R	3N	ob				1
6722.74	-3N		Si?	5.84	7.67	1
6723.29	-3		Atm			1
6724.685R	-2	ob?	⊙			
6725.364R	1	0	Fe	4.09	5.92	
6725.710R	-3		⊙			
6726.282	-3N		O	9.11	10.94	
6726.673R	3	2	Fe	4.59	6.42	
6728.671R	-3		Atm			
6729.019R	-1	0	Fe			
6729.745R	-2		Atm			
			Cr	4.37	6.20	
			Si?p	5.93	7.76	
6730.307R	-2		Si?p	5.93	7.76	
6731.16	-3		Atm?			1
6732.068R	-1	-1N	Fe	4.56	6.40	
6732.669R	-3		Atm?			
6733.153R	1	0	Fe	4.62	6.45	
6733.531R	-3NN		⊙			
6734.272R	-2NN		Cr?-	4.17	6.01	
6734.67	-3N		Atm			1
6735.025R	-3N		Fe p	4.42	6.25	
6735.456R	-3	0?	⊙			24
6735.847R	-3		⊙			
6736.546R	-3		Fe p	4.28	6.11	
6737.28	-3		Fe p	3.25	5.08	3
6737.978R	1	1	⊙			
6738.233	-2		⊙			
6738.62	-2		⊙?			
6738.828R	-1	ob?	⊙			
6739.21	-3		⊙			3
6739.524R	0	2	Fe	1.55	3.38	
6739.993R	-3NN		⊙			
6740.46	-3NN		Atm			1
6741.017R	-3NN		⊙			
6741.629R	1N	ob?				
6742.284R	-3		⊙			
6742.565R	-3NN		Atm?			
6742.90	-3NN		⊙?			1
6743.127R	1	4	Ti	0.90	2.73	
6743.575R	-2NN	ob	S	7.83	9.66	8
6743.89	-3N		⊙			1
6744.50	-3N		⊙			1
6745.113R	-1	-1	Fe	4.56	6.39	
6745.547R	-2	1	Ti p	2.23	4.06	
6745.984	-1	0?	Fe p	4.06	5.89	24
6746.36		0N	Ti?	1.88	3.71	
6746.975R	-2		Fe p	2.60	4.43	
6747.561R	-3NN		⊙?			
6748.139R	-3		⊙			
6748.435R	-2N		Atm			
			Ti?	1.87	3.70	
6748.779R	-3N		S	7.83	9.66	8
6748.870R	-2N		Cr	4.37	6.20	
6749.541R	-3		Fe p	3.63	5.45	
6749.88	-3		Atm?			1,3
6750.164	5	6	Fe	2.41	4.24	
6751.440R	-3N		Cr	5.25	7.08	
6751.55	-3		Atm			1
6752.43	-3		Atm			1
6752.716R	2	0	Fe	4.62	6.45	
6753.470R	-2		Fe p	4.54	6.37	
6754.44	-3NN		⊙?			1
6754.68	-3		Atm			1
6754.939R	-2N		⊙			
6755.605R	1	1	Fe			
6756.568R	-3		Fe?p	4.28	6.10	
6757.08	-3		⊙?			1
6757.195R	0NN	ob	S-	7.84	9.66	8,24
6757.660R	-3		Atm			
6758.27	-3N		Atm			1
6758.897R	-3NN		⊙			
6759.46	-3		Ni?	4.22	6.04	1
6760.34	-3N		Atm			1
6761.011R	-3N		Fe p	4.56	6.39	
6761.55	-3					1
6762.156R	-3		⊙			
6762.398R	-3	0	Zr	0.00	1.83	
			Cr?	5.26	7.08	
				5.26	7.08	
6763.04	-3N		Atm			1
6763.690R	-3		⊙			
6764.03	-3		⊙			
6764.19	-3		Fe p	4.57	6.40	2 1
6765.52	-3		Atm			1
6765.67	-3		Atm			1
6766.16	-3		⊙?			1
6766.50		1N	⊙			
6766.71	-3		⊙?			1
6767.784	6	7	Ni	1.82	3.64	
6768.28	-3		Atm?			1
6768.83	-3		⊙			1
6769.682R	-3		Fe p	4.56	6.38	
6770.46	-3		Atm			1
6770.97	1	3w	Co	1.87	3.70	1 2
6771.12	2		⊙			
6771.904R	-3		Atm			
6772.321R	3	3	Ni	3.64	5.46	
6773.37	-3NN		⊙			1,24
6774.33	-3NN		LaII	0.13	1.95	1

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6774.800R	-3NN		⊙			
6776.26)	-3		⊙			1 2
6776.50	-3		Atm			1
6777.15	-3		⊙			1
6777.406R	-1	-2	Fe	(4.12	5.95	
				4.17	5.99	
6777.775R	-3NN		⊙?			
6779.61	-3		Atm			1
6779.81	-3		Atm			1
6780.25	-3N		Atm			1
6780.925R	-3		⊙?			
6781.44	-3		Atm			1
6781.815R	-3		⊙			
6782.219R	-2		⊙			
6782.502R	-1N		⊙			
6783.28	-3		Fe p	2.55	4.37	3
6783.714R	0	1	Fe	2.58	4.40	
6784.214R	-1NN	0NN	⊙			
6784.77	-3					1
6785.060R	-2		⊙			
6785.76)	-1N		Fe p	4.56	6.38	
6785.88	-3N		Fe p	4.06	5.88	1
6786.204	-3					
6786.46	-2		Fe p	3.23	5.05	
6786.860R	1	0?	Fe	4.17	5.99	24
6787.16	-3		⊙?			1
6787.604R	-3N		Fe p	4.45	6.27	
6789.154R	-3		Cr	3.83	5.65	
6789.530R	-3NN		Atm			
6789.960R	-3					
6790.322R	-3		Atm?			
6790.686R	-3		⊙?			
6792.330R	-3NN		⊙?			
6793.273R	0	2N	Fe	4.06	5.87	
6793.628R	1	0?	Fe–			
			Y	0.07	1.88	
6794.313R	-2		⊙			
6794.623R	-2		Fe p	4.93	6.75	
6795.06	-3		Atm			1
6795.428R	-3		YII	(1.73	3.55	
				1.71	3.53	
6795.798R	-2		⊙			
6796.128R	0	1	Fe	4.12	5.94	
6796.490R	-3		Cr	4.38	6.20	
6796.814R	-3		⊙			
6798.15	-3		Cr	3.83	5.65	1
6798.467R	-2	1	Ca	2.70	4.51	
6798.888R)	-3		⊙			
6799.05	-3N1		Mg p	5.73	7.54	
6800.017R	-3N		Atm			
6800.607R	0	-1	⊙			
6801.202R	-3		Fe?p	3.27	5.08	
6801.64	-3		Atm			1
6801.849R	-3		Fe p	1.60	3.42	
6802.88	-3		Atm			1
6803.27	-3		Fe p	4.54	6.35	1
6803.854R	-3		Fe p	4.54	6.35	
6804.010R	1	1	Fe	4.63	6.45	
6804.297R	0	0	Fe	4.56	6.38	

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6804.61	-3		⊙			1
6804.878R	-3		Atm			
6805.106R	-3		Cr	3.83	5.64	
6805.44	-3		Atm			
6805.752R	-3		Fe?p	4.56	6.37	
6805.90	-3		Atm			1
6806.856R	1	2	Fe	2.72	4.53	
6807.09	-3		Atm?			
6807.54	-3N		Atm			
6807.893R	-3N		Atm			
6808.769R	-3N		Fe p	2.82	4.63	
6809.27	-3		⊙			1
6809.630R	-3		⊙			
6810.14	-3					1
6810.267S	2	4	Fe	4.59	6.40	
6810.83	-3		Atm			1
6811.02	-3		Atm			1
6811.56	-3		⊙			1
6812.356R	-2N		⊙			
6813.00	-3		Cr	3.83	5.64	1
6813.54	-3		Fe?p	4.96	6.77	
6813.616R	-1		Ni	5.32	7.13	
6813.911R	-3		Si?p	5.96	7.77	
6814.62	-3		Atm			1
6814.83	-3		⊙?			1
6814.961R	1	2	Co	1.95	3.76	
6815.64	-3		Atm			1
6815.96	-3		Atm			1
6817.06	-3		Sc?			1
			Atm			
6817.653R	-3		⊙			
6818.18	-3		Atm			1
6818.38	-3N		Atm			1
6819.49	-3		Fe p	3.00	4.81	1
6819.595R	0	1	Fe	4.09	5.90	24
6819.847R	-3		Atm			
6820.374R	2	3	Fe	4.62	6.43	
6821.24	-3N		Atm			1
6822.042R	-3	-2	Fe	(2.47	4.28	
				4.56	6.37	
6822.29	-3		Atm			1
6823.00	-3		⊙?			1
6823.67	-3		⊙?			1
6823.96	-3N		Atm?			1
6824.52	-3		⊙?			1
6824.857R	-3		Fe p	4.97	6.77	
6825.56	-3N		Atm			1
6826.04	-3		⊙			1
6826.64	-3		Atm			1
6827.15	-3		⊙?			1
6827.277R	-3					
6827.963R	-2		⊙			
6828.193R	-2		⊙			
6828.37	-3		⊙			1
6828.596	3	3	Fe	4.62	6.43	
6829.041R	-3		⊙?			
6829.580R	-3		⊙			
6830.04	-3		⊙?			1
6830.53	-3		Atm?			1

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6830.846R	-3		Atm			
6831.478R	-3		Fe?p	3.20	5.00	
6831.87	-3		⊙?			1
6832.18	-3		⊙?			1
6832.474R	-3		YII?	1.74	3.55	
6833.08	-3		⊙			1
6833.248R	0	ob?	Fe	4.62	6.42	24
6833.592R	-3		⊙			
6834.11	-3		⊙?			1
6834.34	-3N		⊙			1
6835.12	-3		Sc?			1
6835.368R	-3NN		⊙			8
6835.75	-3		⊙?			1
6836.702R	-3		⊙			
6837.013R	1	ob?	Fe	4.57	6.38	
6837.39	-3		⊙			1
6837.98	-3N		Fe	4.54	6.37	1
6838.357R	-3N		⊙?			
6838.798	1N	ob?	Fe			
6839.20	-3		⊙			1
6839.835R	1	2	Fe	2.55	4.35	
6840.443R	-3		Atm			
6841.19	-3N		Mg p	5.73	7.53	1
6841.341	4	6	Fe	4.59	6.39	
6841.642R	-3		Fe p	5.08	6.89	
6842.043R	1	ob	Ni	3.64	5.45	
6842.368R	-3		Si?p	5.96	7.76	
6842.689R	2	ob?	Fe	4.62	6.42	
6843.164R	-2		⊙?			
6843.655	4	3	Fe	4.53	6.33	
6844.683R	-3N		Fe p	1.55	3.35	24
6845.22	-3	-1	Y	2.36	4.17	1
			Atm			
6845.57	-3		⊙?			3
6845.98	-3		Fe p	4.54	6.34	1
			Atm			
6846.33	-3		⊙?			1
6847.06	-3NN		⊙?			1
6847.603R	-2N		Atm			
			Fe	4.24	6.04	
6848.566R	0N	ob?	Si	5.84	7.64	
6848.87	-3		Fe p	4.59	6.39	1
6849.302R	-3NN		⊙?			
6850.08	-3		Atm			1,24
6850.439	-1		Ni	3.66	5.46	
6850.81	-3N		Atm?			1
6851.47	-3		⊙			1
6851.652R	-3		Fe p	1.60	3.40	
6852.28	-3		Atm			1
6852.722R	-3		Atm			
6853.20	-3		Atm			1
6853.50	-3		⊙?			1
6853.851R	-3NN		⊙?			
6854.332R	-2		⊙			
6854.538R	-3		⊙			
6854.850	-2	ob?	Fe	4.57	6.37	
6855.166	5	6	Fe	4.54	6.34	
6855.723R	0	0	Fe	4.59	6.39	
6856.13	-3NN					1,3
6856.64	-3N		⊙?			1
6856.87	-3		⊙?			1
6857.251	1	0	Fe	4.06	5.86	
6857.850R	-3		⊙			
6858.155S	4	4	Fe	4.59	6.39	
6858.29	-3		YII?	1.73	3.53	1
6858.604R	-3		Atm?			
6859.09	-3		⊙?			1,3
6859.493R	-3		Fe p	2.83	4.63	
6859.748R	-3		⊙			
6860.099R	-3		Fe p	4.81	6.61	
6860.327	-3		Fe	2.60	4.40	
6860.80	-3		⊙			
6860.953R	-2N		Fe	2.82	4.62	
6861.268R	-3		Ni?	5.34	7.14	
6861.50	-2	2?	Ti	2.26	4.06	
6861.753R	-3		⊙			
6861.945	0	2?	Fe	2.41	4.21	59
6862.496	2	2?	Fe	4.54	6.34	59
6862.858R	-3NN		⊙?			
6863.00	-3NN		⊙?			1
6863.18	-3NN		⊙?			1
6863.41	-3NN		⊙?			1
6863.787R	-3		⊙?			
6863.95	-3NN		⊙?			1
6864.17	-3		Atm			1
6864.324R	-2N		Fe p	4.54	6.34	
6864.514R	-3		⊙?			
6864.945R	-3					
6865.24	-3		⊙			1
6865.443R	-3		⊙			
6865.645R	-3NN		⊙?			
6866.01	-3NN		⊙?			1
6866.342R	-3		Cr			
6866.56	-3		⊙?			1
6866.775R	-3N		⊙?			
6867.05	-3		⊙?			1
6867.187	4		Atm O_2	16,16	1, 0	2
6867.252	6		Atm O_2	16,16	1, 0	
6867.394	3		Atm O_2	16,16	1, 0	
6867.547	8		Atm O_2	16,16	1, 0	
6867.856	2		Atm O_2	16,16	1, 0	
6868.105	11		Atm O_2	16,16	1, 0	
6868.239	10		Atm O_2	16,16	1, 0	26
6868.421	2		Atm O_2	16,16	1, 0	
6868.535	8		Atm O_2	16,16	1, 0	
6868.577			Atm O_2	16,16	1, 0	
6868.915	12		Atm O_2	16,16	1, 0	26
6869.096	11		Atm O_2	16,16	1, 0	
6869.567	-3		Atm O_2	16,16	1, 0	
6869.627	2		Atm O_2	16,16	1, 0	
6869.887	12		Atm O_2	16,16	1, 0	
6870.007	12		Atm O_2	16,16	1, 0	
6870.330	-4N		Atm			
6870.620	-1		Atm O_2	16,16	1, 0	
6870.819	-3		Atm O_2	16,16	1, 0	
6870.946S	13		Atm O_2	16,16	1, 0	
6871.285	15		Atm O_2	16,16	1, 0	
6871.872	-3		Atm O_2	16,16	1, 0	

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6872.247	14		Atm O_2	16,16	1, 0	26
6872.44	-3N		Co	2.00	3.80	1
6872.843	16		Atm O_2	16,16	1, 0	
6873.392	-4		Atm O_2	16,16	1, 0	
6873.798	14		Atm O_2	16,16	1, 0	
6874.114	-4d?		Atm			
6874.653	16		Atm O_2	16,16	1, 0	
6875.190	-4		Atm			
6875.45	-2		Fe	2.44	4.24	1
6875.590	14		Atm O_2	16,16	1, 0	
6875.995	-2		Fe	4.17	5.96	
6876.38	-2		⊙			
6876.715	14		Atm O_2	16,16	1, 0	
6876.972	-3		Atm			
6877.177R	-3d?					
6877.637	12		Atm O_2	16,16	1, 0	27
6877.991	-4		Atm O_2	16,17	1, 0	3,26
6878.215	-4		Atm			
6878.315	-4		Atm O_2	16,17	1, 0	
6878.436	-4d?		Atm O_2	16,17	1, 0	
6878.630	-4		Atm O_2	16,17	1, 0	3
6879.041	12		Atm O_2	16,16	1, 0	27
6879.265R	-3					
6879.393	-4		Atm O_2	16,17	1, 0	
6879.481	-4		Atm O_2	16,17	1, 0	
6879.55	-3		Fe p	3.25	5.05	1
				4.45	6.25	
6879.928S	10		Atm O_2	16,16	1, 0	27
6880.08	-4		Atm O_2	16,17	1, 0	2
6880.446	-4		Atm O_2	16,17	1, 0	
6880.637	0		Fe	4.14	5.93	
6880.757	-4		Atm O_2	16,17	1, 0	
6881.054	-3N		Fe p	4.63	6.43	
			Atm O_2	16,17	1, 0	
6881.160	-3		⊙			
6881.463	0		Fe			
			Atm O_2	16,17	1, 0	
6881.716	1	2?	Cr	3.42	5.22	
			(Atm O_2)	16,17	1, 0	24
6882.277	-4		Atm O_2	16,17	1, 0	
6882.447	-4		Atm O_2	16,17	1, 0	
6882.502	2	3	Cr	3.42	5.22	
6882.83	-4		Atm			1
6883.070	2	4	Cr	3.42	5.22	
6883.108	-4		Atm O_2	16,17	1, 0	
6883.230	-4		Atm O_2	16,17	1, 0	
6883.371	-3N		⊙?			
6883.833	11		Atm O_2	16,16	1, 0	
6884.041	-4		Atm O_2	16,17	1, 0	26
6884.45	-3N					1
6885.004	-4		Atm O_2	16,17	1, 0	26
6885.279	-4		Atm O_2	16,18	1, 0	26
6885.349	-4		Atm O_2	16,18	1, 0	26
6885.477	-4		Atm O_2	16,18	1, 0	
6885.754	13		Atm O_2	16,16	1, 0	27
			(Fe)	4.63	6.42	
6886.048	-4		Atm O_2	16,17	1, 0	
6886.131	-4		Atm			
6886.209	-4		Atm O_2	16,18	1, 0	26
6886.303	-4		Atm O_2	16,18	1, 0	
6886.372	-4		Atm O_2	16,18	1, 0	26
6886.476	-4		Atm O_2	16,18	1, 0	
6886.579	-4		Atm O_2	16,18	1, 0	26
6886.743	15		Atm O_2	16,16	1, 0	
6887.000	-3		Atm O_2	16,18	1, 0	26,27
6887.154	-4		Atm O_2	16,17	1, 0	
6887.196	-4		Atm O_2	16,18	1, 0	
6887.476	-3		Atm O_2	16,18	1, 0	43
6887.564	-3		Atm O_2	16,18	1, 0	
6887.75	-3NN		Zr O?			1,43
6888.000	-2		Atm O_2	16,18	1, 0	26,27
6888.323	-4		Atm O_2	16,17	1, 0	
6888.457	-3		Atm O_2	16,18	1, 0	
6888.612	-3		Atm O_2	16,18	1, 0	
6888.948	15		Atm O_2	16,16	1, 0	27
6889.271	-3		Atm O_2	16,18	1, 0	
6889.585	-3		Atm O_2	16,18	1, 0	
6889.903	17		Atm O_2	16,16	1, 0	27
6890.10	-3		Atm O_2	16,18	1, 0	
6890.240	-3		Atm O_2	16,18	1, 0	
6890.760	-3		Atm O_2	16,18	1, 0	
6890.948	-3		Atm O_2	16,18	1, 0	
6891.352R	-3N		Atm?			
6891.593	-3		Atm O_2	16,18	1, 0	
6891.719	-3nl		Atm O_2	16,18	1, 0	
			⊙			
6892.369	17		Atm O_2	16,16	1, 0	
6892.57	-3		Atm O_2	16,18	1, 0	1,26
6893.309	19		Atm O_2	16,16	1, 0	27
6893.40	-3		Atm O_2	16,18	1, 0	1,26
6894.379	-3		Atm O_2	16,18	1, 0	27
6894.451	-3		Atm O_2	16,18	1, 0	
6894.89	-3N		Mg p	5.73	7.52	1
6895.382	-3		Atm O_2	16,18	1, 0	27
6895.521	-3		Atm O_2	16,18	1, 0	
6895.73	-4		Atm			1
6896.037	18		Atm O_2	16,16	1, 0	27
6896.445	-4		Atm O_2	16,18	1, 0	27
6896.664	-4		Atm O_2	16,18	1, 0	
6896.965	20		Atm O_2	16,16	1, 0	
6897.27	-2N		⊙?			
6897.352	-4		Atm O_2	16,17	1, 0	
6897.562	-4		Atm O_2	16,18	1, 0	
6897.688	-4		Atm			
6897.886	-3		Atm			
6897.946	-4		Atm O_2	16,17	1, 0	
6898.307	0	ob?	Fe	4.20	5.99	24
6898.918	-4		Atm O_2	16,17	1, 0	
6899.500	-4		Atm			
6899.596	-4		Atm O_2	16,17	1, 0	
6899.954	17		Atm O_2	16,16	1, 0	
6900.543	-4		Atm O_2	16,17	1, 0	
6900.868	19		Atm O_2	16,16	1, 0	
6901.271	-4		Atm O_2	16,18	1, 0	27
6901.533	-4		Atm			
6901.607	-3		Atm O_2	16,18	1, 0	
6901.950	-4N		Atm			2
6902.230	-4		Atm O_2	16,17	1, 0	

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
6902.620	-3		Atm O_2	16,18	1, 0	
6902.874	1	ob	Fe			60
6903.040	-3		Atm O_2	16,18	1, 0	27
6903.149	-4		Atm			
6903.788	-4		Atm			
6903.828	-4		Atm			
6904.117	15		Atm O_2	16,16	1, 0	27
6904.531	-3		Atm O_2	16,18	1, 0	
6905.023	17		Atm O_2	16,16	1, 0	27
6905.317	-2		⊙			
6905.494	-3		Atm O_2	16,18	1, 0	
6905.786	-4		Atm O_2	16,17	1, 0	
6906.000	0		Atm ⊙?			
6906.059	-4		Atm O_2	16,18	1, 0	
6906.27	-2N		⊙			1
6906.60	-4		Atm			1
6906.728	-4		Atm O_2	16,17	1, 0	
6906.830	-4		Atm			
6907.023	-3		Atm O_2	16,18	1, 0	
6907.39	-4N		Atm			
6907.655	-3		Atm O_2	16,18	1, 0	27
6908.28	-4		Atm			
6908.534	12		Atm O_2	16,16	1, 0	27
6909.32	-3		Atm O_2	16,18	1, 0	
6909.431	13		Atm O_2	16,16	1, 0	27
6910.250	-3		Atm O_2	16,18	1, 0	
6910.648	-4		Atm O_2	16,17	1, 0	
6910.728R	-3NN		⊙?			
6911.015	-3		Atm O_2	16,18	1, 0	
6911.369	-1		Atm			
6911.522	0		Fe	2.41	4.20	
			(Atm O_2)	16,17	1, 0	
6911.952	-3		Atm O_2	16,18	1, 0	
6912.27	-3NN		⊙			
6912.45	-2NN		Fe?p	2.83	4.62	
6912.73	-4		Atm O_2	16,17	1, 0	
6912.786	-3		Atm O_2	16,18	1, 0	
6913.200	10		Atm O_2	16,16	1, 0	
6913.371	-3		Atm			
6913.615	-4		Atm O_2	16,17	1, 0	
6913.713	-3		Atm O_2	16,18	1, 0	
6914.090	10		Atm O_2	16,16	1, 0	28
6914.26	-3		Atm			3
6914.564	6	9	Ni	1.94	3.73	
			(Atm O_2)	16,18	1, 0	
6914.80	-4		Atm			
6915.004R	-3N		⊙?			
6915.19	-3NN		Fe?			1
6915.43	-4		Atm			
6915.533	-3		Atm O_2	16,18	1, 0	
6915.670	-3		Atm			
			(Atm O_2)	16,17	1, 0	
6915.887R	-2N		Atm			
6916.475	-3		Atm			
			Atm O_2	16,18	1, 0	
6916.686	4	2	Fe	4.14	5.92	24
6917.018	-3		⊙			
			(Atm O_2)	16,17	1, 0	
6917.409	-3		Atm O_2	16,18	1, 0	
6917.505	-1		Atm			
			(Fe p)	4.54	6.32	
6917.815	-4		Atm			
6918.1228	8		Atm O_2	16,16	1, 0	27
6918.429	-3		Atm O_2	16,18	1, 0	
6918.592R	-3N		⊙?			
6919.0028	8		Atm O_2	16,16	1, 0	
6919.327	-2		Atm			27
			Atm O_2	16,18	1, 0	
6919.77	-3NN		CN?		2, 0	40
6919.97	-4		Atm			
6920.149	-4		Atm			
			Atm O_2	16,17	1, 0	11
6920.168	-2		Fe p	4.59	6.37	60
6920.274	-2N		⊙?			
6920.426	-4		Atm O_2	16,18	1, 0	
6920.672	-4		Atm			
6920.900	-3		Atm			
6921.168	-4		Atm			
6921.338	-4		Atm O_2	16,18	1, 0	
6921.577	-2N		Atm			
			(Atm O_2)	16,17	1, 0	
6921.924	-2		Atm			
6922.243	-2		⊙			11
6922.260	-4		Atm			
6922.478	-4		Atm O_2	16,18	1, 0	27
6922.661	0		Atm ⊙?			
6923.286	6		Atm O_2	16,16	1, 0	17
6923.369	-2		Atm O_2	16,18	1, 0	
			Atm			
6923.756	-3		Cr?p	4.40	6.18	2
6923.86	-4		Atm			
			(Atm O_2)	16,17	1, 0	
6924.164	6		Atm O_2	16,16	1, 0	18
6924.25	1?		Cr	3.43	5.22	
6924.450	2		Atm			
6924.597	-4		Atm O_2	16,18	1, 0	
6924.820	-3		Atm			
			(Atm O_2)	16,17	1, 0	
6925.149	-4		Atm			
6925.280	1	3	Cr	3.43	5.22	
6925.497	-4		Atm O_2	16,18	1, 0	
			Atm			
6926.097	-1	0	Cr	3.43	5.22	
6926.385	-3		Fe p	4.56	6.35	31
6926.567	-1		Atm			
6926.767	2		Atm			
			(Atm O_2)	16,18	1, 0	
6926.91	-2		Atm			1
6927.120	-3		Atm			
6927.261	-3		Atm			
6927.675	-4		Atm O_2	16,18	1, 0	
6927.89	-3		⊙?			1
6928.330	-3N		Ni?	3.68	5.46	3
6928.491	-3		Atm			
6928.7288	5		Atm O_2	16,16	1, 0	
6928.88	-3		⊙			1,3
6929.091	3		Atm			
			(Atm O_2)	16,18	1, 0	

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	Data	Notes
6929.310	5		Atm			
6929.599	5		Atm O_2	16,16	1, 0	
6929.839	4		Atm			
			(Atm O_2)	16,18	1, 0	
6929.938	1		Atm			
6930.384	-3NN		Fe?p	4.54	6.32	
6930.605	3		Fe	4.56	6.34	
			Atm			
6930.837	-3		Atm			
6931.103	-3N		⊙			
6931.323	6		Atm			
			(Atm O_2)	16,18	1, 0	
6931.769	4		Atm			
6932.042	3		Atm			
6932.150	3d?		Atm ⊙			
			(Atm O_2)	16,18	1, 0	
6932.498R	-3		Atm			
6932.757R	-3		Atm			
6933.026	0	-2N	Fe	4.17	5.95	24
6933.163	-3N		⊙			
6933.467	1		Atm			
6933.605	3d		Atm			
			Fe	3.42	4.20	
				4.12	5.90	
			(Atm O_2)	16,18	1, 0	
6933.817	5		Atm			
6934.058R	-3		Atm?			
6934.201R	-3		Atm?			
6934.422S	3		Atm O_2	16,16	1, 0	
6934.531	-4		Atm O_2	16,18	1, 0	
6934.886R	-3		Atm			
6935.113	1N		Atm			
6935.280	3		Atm O_2	16,16	1, 0	
6935.422	-3		Atm			
6935.818	1		Atm			
6936.066	-4		Atm O_2	16,18	1, 0	
6936.496	-1		Fe p	4.59	6.37	
6936.962	-4		Atm O_2	16,18	1, 0	3
6937.25	-3NN	-2NN	⊙			3
6937.703	9		Atm			
6937.928R	-3		Atm			
6938.199	-2		Atm			
6938.269	4		Atm			
6938.548	-4		Atm O_2	16,18	1, 0	3
6938.737	-2NN	0	⊙			
6939.277	-3NN		⊙?			3
6939.613	8		Atm			
			(Atm O_2)	16,18	1, 0	
6939.738	-2		Atm			
6940.192	11		Atm			
6940.375	0		Atm O_2	16,16	1, 0	
6940.72	-3NN		⊙?			
6940.998	0		Atm			
6941.218	5		Atm			
			Atm O_2	16,16	1, 0	
6941.356	-4		Atm			
6942.153	8		Atm			
6942.372	5		Atm			
6942.488	-4		Atm			

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	Data	Notes
6942.84	-2NN		Fe?p	4.12	5.90	
6943.18	-3NN		⊙			
6943.637	-3		Fe?p	5.37	7.15	
6943.803	10		Atm			
6943.94	-3		Atm?			1
6944.384	-4		Atm			32
6944.815	-4		Atm			
6945.210	5	5	Fe	3.41	4.19	
6945.520	-3NN		⊙			
6945.900	-2NN		⊙?			
6946.330	-3NN		Co?	3.27	4.05	
6946.590	-2		Atm O_2	16,16	1, 0	
6946.728	-4		Atm			
6947.139R	-3					
6947.45	12ns		Atm			
			Fe	4.56	6.34	
				4.57	6.35	
6947.64	3		Atm			
			(Atm O_2)	16,16	1, 0	
6947.879	-3		⊙?			
6948.174	-4		Atm			
6948.979	4		Atm			
6949.086	4		Atm			
6949.782	-2N		Atm ⊙			31
6949.921R	-3N		Atm?			
6950.749	5		Atm			
6951.237	6		Atm			
			Fe	4.54	6.31	
				4.54	6.31	
6951.584	-4		Atm			
6951.656	-1		Fe	4.26	6.04	
6952.228	-4		Atm			
6952.33	0N	1N?	⊙ Atm			31
6952.920	-4		Atm			
6953.057	1N	-1N	Fe p–	3.59	5.36	11
6953.072	-4		Atm O_2	16,16	1, 0	
6953.576	5		Atm			
6953.776	2		Atm			
6953.912	-4		Atm O_2	16,16	1, 0	
6954.014	-4		Atm O_2	16,16	2, 1	
6954.22	-3		⊙?			1
6954.494	-4		Atm O_2	16,16	2, 1	
6955.040	-1	ob?	Ni	3.69	5.46	11
			(Atm O_2)	16,16	2, 1	
6955.241	-3		Atm			
			(Atm O_2)	16,16	2, 1	
6955.433	-4		Atm			
6955.521	-4		Atm O_2	16,16	2, 1	
6955.641	0		Atm			
6955.818	-4		Atm			
6956.214	-4		Atm O_2	16,16	2, 1	26
6956.401	10		Atm			
6956.487	4		Atm			
6957.009	-4		Atm			
6957.204	-4		Atm O_2	16,16	2, 1	
6957.404	-1		Atm			
			(Atm O_2)	16,16	2, 1	
6957.554	-4		Atm			
6957.703	-3N		⊙?			

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	Data	Notes
6957.986	-4		Atm			
6958.247	-4d?		Atm			
6958.462	-4		Atm O_2	16,16	2, 1	
6958.936	-3		Atm			
			(Atm O_2)	16,16	2, 1	
6959.4528	9		Atm			
6959.812	-3		Atm O_2	16,16	1, 0	
6959.946	-4		Atm O_2	16,16	2, 1	
6960.330	-1	ob?	Fe	4.57	6.35	11
6960.476	-4		Atm			
6960.647	-3		Atm O_2	16,16	1, 0	
6960.746	-4		Atm O_2	16,16	2, 1	
6960.89	-4		Atm			
6961.2608	11		Atm			
6961.707	-4		Atm O_2	16,16	2, 1	
6961.808R	-3N		⊙?			
6961.946R	-3N		Atm?			
6962.085	-4		Atm			
6962.562	-3N		⊙?			
6962.804	-4		Atm O_2	16,16	2, 1	
6963.01	-3N		Fe p	4.17	5.94	1
6963.622	-1		Atm			
6963.773	-4		Atm O_2	16,16	2, 1	
6964.275	-4		Atm			3
6964.538	5		Atm			
6965.052	0		Atm			
6965.408	-1N	ob	Mg p	5.73	7.50	
6965.925	-3N		⊙			
6966.837	-4		Atm O_2	16,16	1, 0	
6967.650	-4nl		Atm O_2-	16,16	1, 0	
6967.743	-4		Atm			
6967.999	-2NN		⊙?			
6968.265	-3N		⊙?			
6968.582	-3NN		⊙?			
6969.015	-4		⊙?Atm			
6970.055	-4		Atm O_2	16,16	2, 1	
6970.495	1	-1	Fe p	3.00	4.77	
6970.874	4		Atm			
6971.136	-2		Atm			
6971.367	-4		Atm			
6971.51	-3		⊙			1
6971.799	0	ob?	Atm ⊙?			
6971.917	0	1?	Fe	3.00	4.77	
			(Atm O_2)	16,16	2, 1	
6972.298	-4		Atm			
6972.428	-4		Atm			
6973.027	-4d		Atm			
			Atm O_2	16,16	2, 1	
6973.374	-2		Atm			3
6974.03	-4		Atm			1
6974.489	-3		Atm			
6974.763	-2		Atm			
6974.943	-4		Atm			
6975.239	-4		Atm O_2	16,16	2, 1	
6975.440	2	-1	Fe			
6975.754	-3NN		⊙?			
6976.023	-4		Atm			
6976.129	-3		Atm			

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6976.24	-2	ob	Fe	4.62	6.39	
			(Atm O_2)	16,16	2, 1	
6976.504	2	-2	Si	5.93	7.70	
6976.708	-4		Atm			
6976.908	-1		Fe	4.56	6.33	
6977.466	2	2	Atm			
			Fe	4.57	6.34	
6978.045R	-3		⊙			
6978.383	4	6	Cr	3.45	5.22	
6978.740	-4		Atm O_2	16,16	2, 1	
6978.8628	6	7	Fe	2.47	4.24	
6979.156	-3		Fe p	2.82	4.59	
6979.251	-2		Atm			3
6979.596	-3		Atm			
6979.705	-4		Atm O_2	16,16	2, 1	
6979.806	2	5	Cr	3.45	5.22	
6980.369	-3		⊙?			
6980.910	-2	-1?	Cr	3.45	5.22	24
6981.464	3d		Atm-			
6981.601R	-2		⊙			
6981.946	-3		⊙?			
6982.285	-3		⊙?			
6982.501	-4		Atm O_2	16,16	2, 1	
6983.452	-4		Atm O_2	16,16	2, 1	
6983.52	-3N		Fe?p	4.57	6.34	
6984.114	-3		⊙			
6984.606R	-3		⊙ Atm?			
6984.936	1		Atm			
6985.512R	-3		Atm?			
6985.690	-4		Atm			
6985.812	-1		⊙?			
6986.087	-3NN		⊙?			
6986.5798	8		Atm			
			(Atm O_2)	16,16	2, 1	
6987.482	-4		Atm O_2	16,16	2, 1	
6987.731	-3		Atm			
6987.866	0N		Atm			
6988.272R	-3N		⊙?			
6988.403	-4		Atm			
6988.533	2	4	Fe	2.39	4.16	
6988.9868	8		Atm			
6989.561R	-3		⊙			
6989.72	-3		Fe p	4.59	6.35	1
6990.073	-3		⊙?			3
6990.370	2		Atm			
6990.839	-4		Atm O_2	16,16	2, 1	
6991.026	0		Atm			
6991.804	0		Atm			
			(Atm O_2)	16,16	2, 1	
6991.907	-4		Atm			
6992.16	-3		Atm			1, 2
6992.40	-3		Atm			1
6992.846	0		Atm			
6993.521	4		Atm			
6994.05	-3					1
6994.110R	3		Atm			
6994.371R	-2N		⊙?			
6994.622	-2		⊙?Atm			

I A	Intensity Disk	Spot	Ident	E P or Band Data		Notes
6994.83	-3		Atm?			1
6994.958	-3		Atm			
6995.378	-4		Atm O_2	16,16	2, 1	
6996.310	-4		Atm O_2	16,16	2, 1	
6996.634	-3	-1N	Ti	2.32	4.09	
6997.080	-3		Fe p	4.93	6.70	3
6997.811R	-3N		⊙?			
6998.012	0	3	Atm ⊙			
6998.236R	-3		⊙?			
6998.718	0		Atm			
6998.962	5		Atm			
6999.228R	-3		Atm			
6999.563R	-3		Atm			
6999.885	4	4	Fe	4.09	5.85	24
7000.291R	-3		⊙			
7000.623	0	-1	Fe	4.12	5.89	
7000.865R	-3		Atm			
7001.215R	-3		⊙			
7001.551	-1	0N	Ni	1.93	3.69	
7001.92	-3		Atm?			1
7002.128	0		Atm			
7002.62	-3		Atm			
7003.574	5N	4N	Si	5.94	7.70	
7003.977R	-3N		⊙			
7004.314	1		Atm			
7004.41	-3		Atm			1
7004.745	5		Atm			
7005.119	-1		Atm			
7005.37	-3		Atm			
7005.61	-2		Atm			
7005.900	4	1N	Si	5.96	7.72	60
7006.156	-2		Atm			
7006.31	-3		Atm			1
7006.62	-3		Atm			1 2 1
7006.72	-3		Atm			
7006.876	-1N		Atm			
7007.115	-1N		Atm			
7007.52	-3		Atm?			1
7007.68	-3		Atm?			1
7007.976	1	ob?	Fe	4.16	5.92	24
7008.265	-1	0N	Atm			
			Ti	2.32	4.09	
7008.42	-3		Atm?			1
7009.22	-3					
7009.32	-2		Atm			1
7009.64	-3		Atm?			1
7009.838	1		Atm			
7010.306	-1N	ob?	Fe	4.56	6.32	24
7010.62	-3		Atm			
7010.71	-3		Atm			
7010.936	0	2	Atm			
			Ti	2.32	4.08	
7011.207	-1		Atm			1
7011.323	6		Atm			
7011.869R	-3		⊙?			
7012.229R	-3		Atm			
7012.612	2N1	ob	⊙			
7013.31	-2		Atm			
7013.816R	-3		Atm			
7014.08	-3		Atm			1
7014.28	-3		Atm?			1
7014.546R	-3		⊙			
7014.996	0	0	Fe	2.44	4.20	24
7015.295	0		Atm			
7015.536R	-3		Atm			
7015.77	-3		Atm			1
7015.915R	0		Atm			
7016.067R	4	5	Fe	2.41	4.17	
7016.442	8ns	8	Fe	4.14	5.90	
			Atm			
7016.62	-1N		Co	2.00	3.76	1,5 2 1
7016.72	0N		⊙			
7017.312R	0	ob?	Si	5.85	7.60	24
7017.45	0		Atm			1
7017.666	1N	ob?	Si	5.85	7.60	
7018.06	-3N		⊙			1
7018.79	-2		Atm			
7019.10	-1N		⊙			1
7019.356	1		Atm			
7020.14	-2d?		⊙			
7020.63	-1		Atm			
7020.83	-1		Atm			
7021.54	-2		⊙?			
7022.035R	-3N		Atm?			
7022.385R	-1		Fe p	4.28	6.04	
7022.52	-1		Atm			
7022.957S	4	6	Fe	4.17	5.93	
7023.504S	5		Atm			
7023.73	-2		Atm			
7024.065	1	0	Fe	4.06	5.82	
7024.392R	-3					
7024.644	2	1N	Fe	4.54	6.30	
7024.86	1	1	Ni	4.52	6.28	
7025.58	-3		⊙?			1,24
7025.75	-3		⊙?			1
7026.18	-3		Atm			1
7026.394	0		Atm			
7026.61	0N		Atm			
7026.937	1		Atm			
7027.12	-3		Atm			1
7027.478S	5		Atm			
7027.65	-3		Fe	4.56	6.32	1
			Atm?			
7027.859	0		Atm			
7028.196R	-3		⊙?			
7028.59	-1		Fe p—	3.06	4.81	
			Ni p	3.69	5.45	
7029.05	1N	1N	⊙			24
7029.712R	-3		⊙?			
7030.021	1	0	Ni	3.53	5.28	
7030.386R	-3		Atm			
7030.68	-2N		Atm			1
7030.944R	-3		Atm			
7031.09	-2		Fe p	4.63	6.39	1
7031.40	-3N		Fe p	4.97	6.72	1
7031.74	-3		Atm?			1

I A	Intensity Disk	Spot	Ident.	E P or Band	Data	Notes
7032.09	-3		⊙?			1
7032.319	1N	0	⊙			
7032.51	-3		Atm			1
7033.57	-3NN		⊙?			1
7034.090	-2		Fe p	4.54	6.29	
				4.59	6.34	
7034.380	-2	-2?	Ni	3.53	5.28	
7034.910S	5	3	Si	5.85	7.60	60
7035.856R	-3	-2N	Ti	3.13	4.88	
7036.96	-3		Fe?p	2.21	3.97	1
7037.196	1		Atm			
7037.38	-1		Ni?	5.47	7.22	1
7037.534	3		Atm			
7037.98	-3N		⊙			
7038.220	4	5	Fe	4.20	5.95	
7038.765	2	3	Fe	4.24	5.99	
			Ti	2.33	4.09	
7039.284	1		Atm			
			(Ti)	3.14	4.89	
7039.793	7		Atm			
7040.587R	-3		Atm			
7040.81	-3N		⊙?			1
7041.095	-3		Atm			
7041.751	1		Atm			
7042.13	-3		Atm			1
7042.44	-3		Atm?			
7042.96	-3		Atm			1
7043.40	-3		⊙?			1
7043.74	-3		Atm			1
7043.990R	-3		⊙?			
7044.50	-1		Atm			
7044.65	-1		Fe	4.93	6.69	24
7044.93	-3		⊙?			1
7045.038R	-3		⊙?			
7045.233	-1		⊙?			
7045.44	-2N		⊙?			1
7045.781R	-3N		⊙?			
7045.99	-3		Atm?			1
7046.50	-3		Atm?			1
7046.863	2		Atm			
7047.08	-2d?		⊙?			1
7047.349	-2		Atm			
7048.00	-3		Atm			
7048.22	-3		Atm			
7048.68	-3		Atm			1
7048.996	-3N		Atm			
7049.41	-3		Atm			1
7050.50	0		Atm			
7050.78	-3	-1	Ti	2.33	4.09	1
7050.853	4		Atm			
7051.22	-3		Atm			
7051.72	-3N		⊙?			1 2
7051.85	-3N		⊙?			1
7052.34	-3					1
7052.404	1		Atm			
7052.60	0		Atm			1
7052.776	3		Atm			
7052.87	2	4	Co	1.95	3.70	
7053.484	-3		Atm			

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
7053.85	-3		⊙?			1
7054.000	-2		Co	2.71	4.46	
7054.58	-1		Atm			1,40
7054.706	0		Atm			
7055.04	-2		⊙?			1
7055.80	-3		Atm			1
7055.927	2N	ob?	⊙			
7056.30	-3		Atm			1
7056.474R	-3		⊙?			
7056.65	-3		⊙?			1
7056.997	3		Atm ⊙			
7057.544R	-3		Atm			
7057.92	-2		Fe p	3.64	5.39	
7058.20	-1		Atm			
7058.632	-2		Atm			
7059.06	-3		⊙?			1
7059.24	-3		⊙?			1
7059.47	-2					1 2
7059.64	-2		Atm			1
7060.00	-2		Atm			
7060.446	2N1	2?	Atm			
			Mg p	5.73	7.48	
7060.80	-3					1
7061.35	-3					1
7061.507	1		Atm			
7061.79	-3		Atm?			1
7062.31	-3		Atm			1
7062.473R	-3		⊙?			
7062.79	-3		Atm			1
			Fe p	4.97	6.71	
7062.978R	1	1	Ni	1.94	3.69	
7063.19	-3					1
7063.36	0	ob?	⊙?			1
7063.483	3	ob	-Ni?	4.52	6.27	
7064.12	-3		Atm			
7064.64	-1N		Atm			
7064.88	-3		Atm			1
7065.08	-3	-1				1,56
7065.24	-2N		He?	20.87	22.62	1,56
7065.642	3		Atm			
7065.74	-3N		He?	20.87	22.62	1,56
7065.91	-3					1
7066.218R	0	ob?	LaII	0.00	1.75	
			Fe?p	4.97	6.71	
7066.29	-1N		Atm			1
7066.60	-3		Atm?			1
7066.933R	0		Atm			
7067.04	-1		Atm			1
7067.460	Ons	-2	FeII			
7067.83	-3		Atm			1 2
7068.07	-1		Fe p	4.97	6.71	1
7068.423	4	ob?	Fe	4.06	5.80	10
7068.64	0	ob?	Fe p	4.89	6.64	24
7068.84	-3		⊙?			1
7069.06	-2	-1	Ti	3.17	4.91	
7069.54	-2		Fe	2.55	4.39	
7069.80	-3		Atm			1
7070.10	-3	-1	Sr	1.84	3.58	1
7070.35	-3		⊙?			1

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	Data	Notes
7070.663R	-2		⊙ Atm			
7071.63	-3		Atm			1
7071.866	1N	ob	Fe	4.59	6.33	
7072.07	-2		Atm			1
7072.46	-2		Atm			
7072.80	-2	ob?	Fe p	4.06	5.80	24
7073.21	-3		⊙?			1
7073.49	-2		Atm			
7073.618R	-2		Atm			
7074.50	-3N	ob?	Fe p	4.59	6.33	1
			Atm?			
7074.90	-2		Atm			
7075.08	-3		Atm			1
7075.27	-3		Atm			1
7075.43	-3		Atm			1
7075.63	-3		Atm			
7075.89	-3		Atm?			1
7076.10	-3		Atm?			
7076.34	-3		Atm			1
7076.52	-3		Atm?			1
7076.815R	-3		Atm?			
7077.22	-3		Atm			1
7077.61	-3		Atm			1
7077.81	-1N		Atm			
7078.05	-3		Atm?			1
7078.252	1		Atm			
7078.841	1		Atm			
7079.27	-1N		Fe p	4.89	6.64	1
7079.51	-3		Atm			1
7079.591	1		Atm			
7079.89	-3		Atm			1
7080.970	1	0	⊙ Atm			
7082.168R	-2N	-1N	⊙			
7082.480	-2		Atm			
7082.827R	-3N	-2N	⊙			
7083.394	2	-1	Fe	4.89	6.63	
7083.716R	-3					
7083.960	1	-1				
7084.254R	-3	-1	Ti p	1.42	3.17	
7084.656	-1N		⊙			
7084.975	3	2?	Co	1.87	3.62	
			Atm?			
7085.533R	-3		⊙			
7086.03	-3		Atm?			1
7086.319	-2		Atm			
7086.730	2	ob	Fe	3.59	5.33	
				5.06	6.81	
7087.35	-2N					1,24
7087.59	-3		⊙			1
7087.822R	-2		⊙?			40
7088.154	3		Atm			
7088.23	-3					1
7088.64	-3		Atm			1
7088.80	-3		Atm?			1
7089.04	-3		Si?p	6.05	7.79	
7089.71	-2N		Atm			
			Fe?p	4.56	6.31	
7090.390	4	4	Fe	4.21	5.95	
7090.69	-3		⊙			1
7090.92	-3		CN?		3, 1	1,40
7091.18	-2		⊙			
7091.363R	-3		⊙			
7091.942	0	1	Fe	4.93	6.67	
				4.93	6.67	
7092.31	-3		Atm?			1
7092.59	-3		Atm?			1
7092.848	-1		⊙			
7093.09	0	0w?	Fe p	4.54	6.28	24
7093.34	-3N		⊙?			
7093.68	-3		⊙?			3
7094.05	-1		Atm			
7094.334	-2N		Fe p	3.56	5.30	
7094.76	-3		Atm?			1
7095.01	-2		Atm			
7095.18	-3					1
7095.407	2	ob?	Ni?-	5.26	7.00	
			Fe	4.19	5.93	
7095.58	-3		Atm			1
7095.859	-2		Atm			
7096.383R	-3		Atm			
7096.63	-3		⊙?			1
7096.99	-3		⊙?			1
7097.123	1N		⊙ Atm			
7097.666	-3		Atm			
7097.76		-1?	Zr	0.68	2.42	24
7098.02	-3NN		Atm			1
7098.63	-3		Atm?			1
7098.80	-3		Atm?			1
7098.91	-2N		Atm			
7099.22	-3					1
7099.38	-3					
7099.540R	-3					
7100.130	0N	-1?	Atm-			
			Fe?p	2.72	4.45	
7100.68	-1		Atm			
7101.09	-3					1
7101.31	-3		Fe p	2.19	3.93	1
7101.59	-2		Atm			
7101.69	-3		Atm			1
7101.96	-3		Atm			
7102.279	0		Atm			
7102.89	-3N	-1	Zr	0.65	2.39	1
7103.150	0	1nl	Atm			
			Fe p	2.42	4.16	
7103.47	-3					
7103.80	-3	-1	Zr	0.62	2.36	1
7103.90	-3N					1
7104.39	-3					1
7104.71	-3		Atm?			1
7105.08	-3		Atm?			1
7105.28	-3		Si? p	6.06	7.79	2 1
7105.61	-3		⊙?			1
7105.87	-3		Fe p	4.17	5.91	1
7106.164	0		Atm			
7106.44	-1		Atm ⊙			
7107.01	-2					
7107.25	-3		Fe p	5.00	6.74	1
7107.468	1	2	Fe	4.17	5.90	24

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
7107.65	-3					1
7107.909R	-3					
7108.109R	-3N		Atm?			
7108.92	-2NN		⊙?			1,9
7109.06	1		Atm?			1
7109.23	-3					1
7109.32	-3					1
7109.70	-3		Fe p	4.59	6.32	1
7109.96	-3					1
7110.14	-3					1
7110.33	-3					
7110.46	-3					
7110.905	2	1	Ni	1.93	3.66	
7111.14	-3		Atm?			1
7111.450	-1nl		⊙			
7111.94	-2	-3	⊙			24
7112.170	1	1	Fe	2.98	4.71	
7112.732R	-3		Atm?			
7113.171	1N	ob	⊙			
7113.422R	-3					
7113.592R	-3					
7113.90	-3		Atm?			
7114.041R	-3N					
7114.175R	-3		Atm?			
7114.574	0	0N	Fe p	2.68	4.42	
7115.05	-3		⊙			1
7115.17	1N	ob	⊙			24
7115.33	-3		Fe?p	4.59	6.32	
7115.47	-2		Atm			
7115.66	-3		Atm?			
7116.388	-1N		⊙?			
7116.963	1N	ob?	⊙			
7117.669R	-3		Atm?			
7118.105	0	0	Fe p	4.99	6.72	
7118.284	2	1d	Atm ⊙			
7118.42	-3		Atm			1
7118.975R	-3					
7119.38	-3					1
7119.704	1		Atm			
7120.03	1		Atm			
			Fe p	4.54	6.27	
7120.58	-3		Fe p	4.12	5.86	1
7121.67	-3N		⊙?			
7122.206S	7	8	Ni	3.53	5.26	
7122.50	-3					1
7122.75	-2		Atm?			
7123.14	-3		Atm?			1
7123.41	-3		⊙			1
7123.963	-2N		⊙ Atm			
7124.65	-3N		⊙ Atm			1
7124.91	-2N		Fe?p	3.67	5.40	3
7125.33	-2N	-1	Fe p	4.57	6.31	1
			Atm?			
7125.76	-2		Atm?			1,40
7125.96	-1N		Atm?			
7126.17	-3		Atm			
7126.71	-1		Ni	3.53	5.26	3
7126.98	-3		Atm?			1
7127.37	-2		⊙?			
7127.573	2	-1	Fe p	4.97	6.70	
7127.76	-1		⊙			1
7128.150	0		Atm			
7128.528R	-3		Atm			
7129.129	0		Atm ⊙			42
7129.23	-2		Fe?p	4.57	6.30	1
7129.47	-2		Atm?			1
7129.87	0d		Atm?			
7130.12	-3d?					1
7130.64	-2		⊙			
7130.925	6	6	Fe	4.20	5.93	
7131.360	-2		⊙			
7131.63	-3					1
7131.82	-3		Atm?			
7132.21	-3					
7132.985	2	1	Fe	4.06	5.79	
7133.389	-2		⊙			
7134.116	1		Atm			
7134.32	-3N		Co?	4.04	5.77	1
7134.61	-3		Atm?			1
7135.03	-3N		Atm			
7135.58	-3		Atm			1
7135.83	-2N		Atm			
7136.56	-3N		Atm			
7137.21	-2		Atm			1
7137.469	1		Atm			
7137.88	-3		Atm			1 2
7138.08	-2	0?	Ti p	1.42	3.15	1
7138.926	-1	4	Ti	1.44	3.17	
7139.20	-3		Atm?			1
7139.55	-3		Atm?			1
7139.68	-2N		Atm?			
7140.279	1	1N	⊙?			24
7141.03	-3					1
7141.14	-2					
7141.64	-3N		Ni?	5.28	7.01	
7142.16	-2		Atm			
7142.517	2	0	Fe	4.93	6.66	
7142.987	1	ob?	⊙			
7143.382	-3N		Atm			
7143.96	-3d?		⊙?			
7144.754	-3		Atm?			
7145.14	-3		Atm?			1
7145.312	2	1?	Fe	4.59	6.31	
				4.59	6.31	
7145.55	-3					1
7145.90	-2		Atm?			1
7146.16	-3		Atm?			
7146.57	-1nl		⊙?			
7147.28	-1					
7147.634	2		Atm			
7148.150	10	12	Ca	2.70	4.42	
7148.704	-1	-2	Fe	4.26	5.99	
				5.05	6.77	
7149.33	-3N		⊙?			
7149.750	-1					
7150.172	0		⊙			
7150.680	0		Atm			

I A	Intensity Disk	Intensity Spot	Ident	E P	or Band Data	Notes
7151.143	1		Atm			
7151.464	1	2	Fe	2.47	4.20	
7151.70	-3		⊙?			1
7152.22	-3		⊙?			1
7152.51	-3		Atm?			1
7153.06	-2		Atm?			
7153.330	-1		Atm			
7153.746	-1		Atm			
7154.707	-1		Atm			
			Co	2.03	3.76	
7155.09	-2		Atm			
7155.42	-2					1
7155.634	3	2d	Fe	4.99	6.71	24
7156.422	2		Atm			
7157.73	0NN	-2NN	⊙			
7158.508	-1	-1N	Fe	3.64	5.36	
7158.776	2	2d	⊙-Atm			
7159.310	1		Atm			
7160.05	-3		⊙			1
7160.302	-1N	3N	Ti	1.42	3.15	
			Atm			
7160.859	-2		Atm			
			Fe p	5.01	6.73	
7161.11	-3		Atm			1
			Fe p	4.62	6.34	
7161.57	-2		Atm?			1,3
7162.053	1		Atm			
7162.34	0	ob?	Fe p	5.00	6.72	
7162.731	0		Atm			
7163.13	-2		Atm?			1, 2
7163.27	-2		Atm?			1
7163.54	-2		Atm			1
7163.82	0		Atm			
7164.23	-1					1
7164.432	8	8	Fe	4.17	5.90	
7164.62	2N	ob	Si	5.85	7.57	3
7164.83	-2					1
7165.14	-1		Si p	5.85	7.57	
7165.578	4N	ob	Si	5.85	7.57	
7165.71	1	1?	⊙			1
7166.09	0		Atm			
7166.27	-1N		Atm ⊙?			
7166.57	-1		Atm?			1, 2
7166.71	-1		Atm?			1
7166.96	-1	ob	Ni	3.72	5.45	1, 2
7167.10	0		Atm			
7167.360	2		Atm			
7167.904	9		Atm			
7168.48	-3					
7168.73	-2N	ob?	⊙			
7169.063	1		Atm			
7169.11		1	Zr	0.73	2.45	1
7169.895	-1	-1N	Atm ⊙?			24
7170.086	0		Atm			
7170.33	-1		Atm			
7170.568	3		Atm			
7170.869	-1N		Atm			
7171.038	-2		Atm			
7171.75	-3					1
7171.954	0		Atm			
7172.714	6		Atm			
7172.90	1		Atm			
7173.417	6		Atm			
7173.774	3		Atm			
7174.166	3		Atm			
7174.632R	-3N					
7174.84	-3		Atm			
7175.316	-1ns					
7175.50	-3					1
7175.960	5ns	4	Fe-	4.54	6.26	41
			Atm			
7176.146	5		Atm			
7176.59	-3					
7176.878	2	2	Fe	4.97	6.69	
7177.112	3		Atm			
7177.367	4		Atm			
7177.618	4		Atm			
7178.422	3		Atm			
7178.765	-3					
7178.97	-3		⊙?			1
7178.298	2		Atm			
7179.61	-3		⊙?			
7180.004	0	3	Fe	1.48	3.20	
7180.202	-1		⊙ Atm			
7180.56	-3					
7180.79	-3					1
7181.198	4	6	Fe	4.20	5.92	
7181.520	6		Atm			
7181.760	4		Atm			
7181.955	4	3	Ni	3.73	5.45	
			(Fe)	4.89	6.61	
7182.400	-2	-1?	⊙?			24
7182.825	0		Atm			
7183.46	-3N		Atm?			1
7184.38	1		Atm			
7184.526	8		Atm			
7184.90	2N	1N	Si	5.59	7.31	
7185.15	-3					1
7185.29	-3					1
7185.56	-3	-1	Cr	3.88	5.59	24
7186.141	7		Atm			
7186.384	8		Atm			
7187.010	6		Atm			
7187.388	15	15d	Fe-	4.09	5.80	
			Atm			
7188.00	-3N		Atm			
			Cr?	3.87	5.59	
7188.62	-1	3	Ti	1.42	3.14	
7188.99	-1		Atm			
7189.141	2	2	Fe	3.06	4.77	
7189.860	-1	2	Ti	2.57	4.28	
7190.128	0	0	Fe p	3.10	4.81	
7190.42	-3		Atm?			1
7190.73	-3		Atm?			1
7190.96	-2		Atm?			
7191.497	15		Atm			
7191.67	2	1?	Fe	4.97	6.68	1
7191.868	5		Atm			

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
7192.465	5d	5d	⊙-Atm			
7192.759R	-3					
7193.183	1N	ob?	Mg	5.73	7.44	
7193.561	8		Atm			
			(Si)	5.59	7.31	
7193.768	8		Atm			
7194.07	-3		Fe p	5.01	6.73	1
7194.38	-3					
7194.569R	-3		Fe?			
7194.93	0	-1	Fe	5.00	6.71	1
7195.044	7		Atm			
7195.15	-1		Atm			1
7195.525R	-3		Cr?	4.17	5.89	
7195.797	3		Atm			
7196.48	-2N		Atm?			
7197.020	4	5	Ni	1.93	3.64	
7197.231	4		Atm			
7197.41	1		Atm			40
7197.865	5		Atm			
7198.440	8		Atm			
7198.86	-3		Atm			
7199.42	-3N		⊙?			
7199.80	-2		⊙?			
7200.027	-3		⊙?			
7200.097R	-2		⊙?			
7200.37	3		Atm			
7200.56	10		Atm			
7201.197	15		Atm			
7201.476	0N		Atm			
7201.63	-3					1
7201.80	-3		Atm			1
7202.208	8	9	Ca	2.70	4.41	
7202.543	-3		Atm			
7202.835	-2		Atm?			
7203.27	-3N		Atm?			1
7203.850	4		Atm			
7204.08	-2					1
7204.308	15		Atm			
7204.77	-3		Atm			
7205.29	-3		Atm			
7205.536	-2		Atm			
			Fe p	4.71	6.43	
7206.15	-1N		Atm			1
7206.421	15		Atm			
7206.861R	-3		⊙?			
7207.131	4	4	Fe	4.06	5.77	
7207.396	8	8	Fe	4.14	5.85	
7207.84	-2		Atm			24
7208.220	-1		Si?-	5.59	7.31	
7209.504	10	10d	Ti-	1.45	3.17	
			Atm			
7210.08	-3		Atm?			1
7210.450	0ns		Atm			
7211.203	2		Atm			
7212.037	0		Atm			
7212.440	1	0N	Fe	4.93	6.65	
7212.91	-3		⊙			1
7213.28	-2N		Atm?			1
7213.41		0	Ti	1.73	3.44	1

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
7213.51	-3		⊙			1
7213.847	0	-1N	Fe p	4.24	5.95	
7214.40	-3		Atm?			1
7214.60	-3		Atm?			1
7214.74	1	ob?	TiIIp	2.58	4.29	
7214.93	-2	0	Ti	3.68	5.39	1
7215.539	0		⊙			24
7216.19	0	8	Ti	1.44	3.15	
7216.527	9		Atm			
7216.63	-1	ob?	Fe p	4.99	6.70	
7217.28	-3N		Co?	2.53	4.24	
7217.63	-3		Atm			
7218.022	2		Atm			
7218.47	-1N	ob?	⊙			2
7218.65	-1		Atm			
7219.056	0		Atm			
7219.40		0	⊙			1,24
7219.680	3	4	Fe	4.06	5.77	
7220.12	-3		Atm			3
7220.786	-2		Ni	5.34	7.05	
7221.204	2	1	Fe	4.54	6.25	24
7221.586R	-3		Atm?			
7222.397	1	ob	FeII	3.87	5.58	
7222.83	-1	ob?	Fe	4.59	6.30	
				5.04	6.75	2
7223.00	0		Atm			
7223.636	6	6?	Atm-			
			Fe	3.00	4.71	
7224.129R	-3		Atm?			
7224.464	1	ob	FeII	3.87	5.58	
7225.056	-1	0?	⊙			
7225.79	-3N		Fe p	4.97	6.67	1
7226.05	-3					1
7226.208	2N	ob	Si	5.59	7.30	
7226.77	-3		Atm?			1
7227.30	-3		Atm?			1
7227.493	8		Atm			
7227.63	-2		Atm			1
7227.92	-3		Atm?			1
7228.243	0		Atm ⊙?			
7228.700	1	1	Fe	2.75	4.45	
7229.121	-2		⊙			
7229.46	-3N		⊙			1
7230.06	-3		⊙?			1
7230.29	-3		Atm?			1
7230.56	-3		Cr?	3.83	5.54	1
7230.677	1		Atm			
7231.007	1		Atm			
7231.69	-3		⊙?			1
7232.234	7		Atm			
7232.902	12		Atm			
7233.33	-3		⊙?			1
7233.53	-3		Atm			1
7233.88	-3		Atm?			1
7234.09	-3		Atm			1
7234.400	5		Atm			
7234.738	12		Atm			
7235.325	2N	-2	Si	5.59	7.30	
7235.85	0	-1	Si	5.59	7.30	

I A	Intensity Disk	Intensity Spot	Ident	E P or Band Data		Notes
7236.136	8		Atm			
7236.425	0		Atm			
7237.40	-3		⊙?			1
7237.84	-2		Atm?			1
7237.946	1		Atm			
7238.24	-2		Atm?			1
7238.58	-3		Atm?			1
7239.042	1		Atm			
7239.50	-3		Atm			
7239.848	8	8nl	<u>Atm</u>-			
			Fe	4.19	5.90	
7240.53	0	0?	Sc0?			1,39
7240.62	10		Atm			
7240.822	9		Atm			
7241.26	-3		Atm?			1
7242.24	-2N		⊙			
7242.49	-3N					
7243.09	-3		S?	8.01	9.71	1
7243.48	7		Atm			
7243.72	8		Atm			
7244.48	-3N		⊙			5
7244.850	3	6	<u>Ti</u>	1.44	3.14	
			Fe	4.93	6.64	
			(S)	8.01	9.71	
7245.40	-1		Atm			1
7245.676	7		Atm			
7246.09	-1		Atm?			
7246.45	-3d?		⊙			1
7246.794	-1		Atm			
7247.07	1N	2	⊙			
7247.210	6		Atm			
7247.39	-1		Atm			1
7247.90	-3		Atm			
7248.32	-3		⊙?			
7248.924	4		Atm			
7249.34	-1		Atm			1,3
7249.47	-2		⊙			1
7250.216	5		Atm			
7250.64	4N	ob	Si	5.59	7.30	1 2,16
7250.68	0		Atm			1
7251.12	-3		Atm?			1
7251.40	-3		Atm?			1
7251.717	1	3	Ti	1.42	3.13	
7252.075	-1N	-1N?	⊙?			
7252.374	10		Atm			
7252.853	4		Atm			
7253.224	5		Atm			
7253.42	-2		Atm			1
7253.728	9		Atm			
			(Ti)	(1.74	3.44	
				2.15	3.85	
7254.29	-3N		⊙			
7254.648	1	1	Fe			
7254.87	-3		⊙			1
7255.29	-3		Si p	5.94	7.64	
7255.42	-3N		Atm?			
7255.79	-3		⊙?			1
7256.142	1ns	0?	Fe	4.93	6.64	
7256.50	-2		Atm			

I A	Intensity Disk	Intensity Spot	Ident	E P or Band Data		Notes
7256.74	-3		Ni	3.58	5.28	1
7256.99	-2		⊙?			1
7257.104	2		Atm			
7257.371	4		Atm			
7257.934	8		⊙?-<u>Atm</u>			
7258.45	-3		Atm?			1
7258.65	1		Atm			
7258.85	-3		Atm			1
7259.10	0		Atm			
7259.556	0		Atm			
7260.066	0		Atm			
7260.266	0		Atm			2
7260.730	4		Atm			
7261.016	-1		Fe p	2.72	4.42	
7261.30	-3		Fe p	4.89	6.59	1
7261.45	5		Atm			
7261.52	2	2	Fe	4.54	6.24	1
7261.80	-3					1
7261.97	3	4	Ni	1.94	3.64	
7262.01	4		Atm			16
7262.272R	-3		⊙?			
7262.47	-3N		Fe?p	3.63	5.33	1
7262.973	4		Atm			
7263.380	0		Atm			
7263.63	-1		.⊙?			
7264.04	-3		⊙?			1
7264.390	2		Atm			
7264.598	7		Atm			
7265.149	-2		Atm			
			(FeII?)	6.20	7.89	
7265.594	12		Atm			
7265.86	-3					1
7266.28	-2	0	Ti	1.73	3.42	3
7266.96	-3		Fe p	2.17	3.86	1
7267.75	-3N		⊙?			1
7268.05	-3		Atm?			1
7268.217	0		Atm			
7268.566	0		Fe p	3.86	5.56	24
7268.97	-3N		⊙?			1
7269.752	4		Atm			
7269.94	-3					1
7270.131	2		Atm			
7270.300	0		Atm			
7270.864	-2		Atm			
7271.18	-3		Atm?			1
7271.55	-2	0	Ti	1.44	3.13	
7272.112	-2N		⊙			
7272.973	15		Atm			
7273.835	-2		Atm			
7274.259	-3		Atm			
7274.664	-3		Atm?			
7275.33	5N	ob?	Si	5.59	7.29	
7275.398	10		Atm			16
7275.819	1		Atm			
7276.316	2		Atm			
7276.560	2		Atm			
7276.850	3		Atm			
7277.148	2		Atm			
7277.402	12		Atm			

I A	Intensity Disk	Intensity Spot	Ident	E P	or Band Data	Notes
7278.085	4		Atm			
7278.526	-3		Atm			
			Fe p	4.97	6.66	
7278.792	1		Atm			
7279.13	-3N		Atm			1
7279.38	-3N		Atm			1
7279.698	2		Atm			
7280.32	-3N		Atm			1
7280.671	2		Atm			
7280.967	1		Atm			
7281.540	-1		Atm			3
7282.02	-3		Atm			1
7282.302	7		Atm			
			(Fe)	4.99	6.68	
7282.844	3N	2N	⊙			
7283.220	1		Atm			
7283.61	-3					1
7283.770	0	ob?	Mn	4.41	6.10	
7284.18	-3		⊙?			1
7284.56	-3		⊙?			1
7284.842	2	2	Fe	4.12	5.82	
7285.09	-2	-1N?	⊙			1
7285.305	1	ON	Fe	4.59	6.28	
7285.70	-3		Atm?			1
7285.98	-3		Si p	5.94	7.63	
7286.52	-3d?		Ni	3.75	5.45	
7287.378	10		Atm			
			(FeII)	6.19	7.89	
7287.858	-3		Atm			
7288.132	5		Atm			
7288.47	-3					
7288.741	4	4N	Fe	4.20	5.90	
7289.188	7N	6N	Si	5.59	7.29	
7289.53	-3		Atm			1
7289.818	-1		Atm			
7290.415	15		Si-	5.59	7.29	6
			Atm			
7290.895	-1		Atm?			
7291.098	4		Atm			
7291.438	2	2	Ni	1.93	3.62	
7291.75	-3					
7292.172	5		Atm			
7292.695	4		Atm			
7292.841	3	3	Fe	4.54	6.23	
7293.052	4	4	Fe	4.24	5.93	
7293.372	2		Atm			
7293.889	-3		Atm			
7294.20	-3		Atm			
7294.364	2		Atm			
7294.863	2		Atm			3
7295.031	7		Atm			
7295.28	-3		Fe p	4.59	6.28	1
7295.610	2		Atm			
7295.96	-3		Atm?			1
7296.265	2		Atm			
7297.072	-1		Atm			
7297.33	-3		Atm?			1
7297.70	-3		Atm?			1
7297.93	-3		⊙?			1
7298.169	2		Atm			
7298.51	-2N		⊙?			1
7299.643	2d	3	Atm			
			Ti	1.42	3.11	
7299.77	-3		Atm			1
7299.926	5		Atm			
7300.50	-1d		Fe-	4.97	6.66	
			Fe?p	4.12	5.82	16
7300.63	-1		Atm			1
7300.874	0		Atm			
7301.262	-1		Atm			
7301.577	-1	ob	FeIIp	3.87	5.57	3
7302.129	2		Atm			
7302.348	-2		Atm			
7302.603	0		Atm			
7302.777	-1N		Atm			
7302.88	-1N	ob	Mn	4.41	6.10	
7303.197	10		Atm			
7303.76	-3		Atm			
7304.134	5		Atm			
7304.214	7		Atm			
7304.68	-3		Atm			1
7304.80	-3		Atm?			
7304.954	0	1	⊙			
7305.345	-3		Atm?			
7305.628	0		Atm			
7305.873	-1	0	Ti	1.73	3.42	
7306.03	-1		Atm			
7306.31	-3					1
7306.570	2	2	Fe	4.16	5.85	24
7306.95	-3		Atm?			
7307.48	-3N		⊙			
7307.960	3	3	Fe	4.12	5.81	
			FeII	3.87	5.56	
7308.08	1	1	⊙			
7308.757	5		Atm			
7309.518	12		Atm			
7310.201	2		Atm			
			FeII	3.87	5.56	
7310.402	-1		Atm			
7310.62	-3		Atm			
7310.910	2		Atm			
7311.080	4	6	Fe	4.26	5.95	
7311.265	1		Fe p	4.24	5.93	
			Atm?			
7311.484	-2		Atm			
7311.64	-3N		⊙?			1
7312.08	-2N		Fe p	5.01	6.70	1,3
7312.270	-2N		Atm			
7312.616	6		Atm			
7312.962	-2		Atm			
7313.176	0		Atm			
7313.37	-3		Atm			1
7313.62	-3					1
7314.20	-3N		Atm?			1
7314.545	2		Atm			
7314.96	-3		⊙?			1
7315.20	-3		Atm			3
7315.516	7		Atm ⊙			

I A	Intensity Disk	Intensity Spot	Ident	E P	or Band Data	Notes
7315.886	1		Atm			
7316.41	-3		⊙			
7316.57	-3		Atm?			1
7316.739	1		Fe p	2.68	4.37	
7316.858	2		Atm			
7317.291	7		Atm			
7317.43	-1		Fe p	4.99	6.67	
7318.09	4d?		Atm			
7318.382	3	4d	Atm			
			Ti	2.24	3.93	
7318.692	9		Atm			
7319.15	-3		Atm			1
7319.32	-3		Atm?			1
7319.51	-3		Atm?			1
7320.689	4	1	Fe	4.54	6.22	
				4.89	6.58	
			FeII	3.87	5.56	
7320.846	4		Atm			
7321.44		-1	V?	2.11	3.80	
7321.52	-2nl		Atm?			
7322.201	-2		Atm			
7323.10	-3					
7323.354	-3N		Fe?p	3.63	5.31	
7323.972	4		Atm ⊙			
7324.29	-3Nd?		⊙?			1
7324.680	0	0	⊙			
7325.28	-3		Fe p	3.91	5.60	1
7325.56	-3		⊙?			
7325.99	-3		⊙			1
7326.160	8	11	Ca	2.92	4.60	
7326.456	0N	0N	Mn	4.42	6.10	
			Atm			
7326.713	-2		Atm			
7327.104	2		Atm			
7327.370	3		Atm			
7327.650	-2		Ni	3.78	5.46	24
7328.25	0		Atm			
7328.828	-3		⊙			
7329.25	0nl		⊙			
7330.150	0		Fe p	4.62	6.30	
7330.34	-3		⊙?			1
7330.859	9d		Atm			4
7331.04		-3	Ti	1.73	3.42	
7332.28		-1N	Ti	1.74	3.42	
7332.49	-3		⊙?			
7332.74	-3		Atm?			
7332.905	1		Atm			
7333.049	2		Atm			
7333.58	1		Fe	4.24	5.92	
7333.684	5		Atm			
7333.88	-3		Atm			1
7334.25	-3		⊙?			
7334.62	-3		FeII	7.24	8.92	
7334.91	-3		⊙?			
7335.335	4		Atm			
7335.712	-2		Atm			
7336.02	-3N		⊙?			
7336.38	-3		⊙?			
7337.043	-1		⊙			

I A	Intensity Disk	Intensity Spot	Ident	E P	or Band Data	Notes
7337.78		-1	Ti p	2.23	3.91	
7338.07	-3N		⊙?			
7338.94		-1	V	2.13	3.81	1
7339.340	-2N		Atm			
7339.67	-3		⊙?			
7339.90	-3		⊙?			
7340.188	-1	-1	⊙ Atm			
7340.60	-3		⊙?			
7340.83	-3		Fe p	3.40	5.08	
7341.351	0		Atm			
7341.78	-3	-2	Fe p	4.97	6.65	
7342.317	-3		⊙?			
7343.226	-2N		⊙			
7343.63	-3		Atm?			1
7343.939	3d		Atm			
7344.200	-1	-1	Fe p-	2.72	4.40	
			Atm			
7344.46	-3		⊙?			1
7344.759	4d	8d	Ti-	1.45	3.13	
			Atm			
7345.21	-3N		⊙?			
7345.42	-3N		⊙?			
7346.11	-3N		Atm?			1
7346.56	-3N					
7346.87	-3		Fe p	3.29	4.97	
7347.15	-3		Fe p	2.75	4.43	
7347.309	0		Atm			
7348.047	1		Atm			
7348.214	0		Atm			
7348.51	-2N		Fe p	4.12	5.80	
7348.76	-3		Atm			
7349.249	2		Atm			
7349.493	3		Atm			
7350.088	2		Atm			
7350.49	-3NN		Fe p	3.03	4.71	24
7351.113	2	1	Fe	4.97	6.65	
7351.519	3	1	Fe	4.93	6.61	
7352.14	-3	0	Ti	2.48	4.16	
7352.791	-2N	-3N	⊙			
7353.03	-3					
7353.213	-2		Atm			
7353.379	-2	-1	⊙			
7353.507	1	1	Fe	4.71	6.39	
7353.923	0		Atm ⊙?			
7354.606	0	0d?	Atm			
			Co	1.87	3.55	
7355.108	-3N	-1?	⊙			
7355.457	0	-2N	Atm			
			TiIIp	2.59	4.26	
7355.891	5	9	Cr	2.88	4.55	
7356.262	2		Atm?			
7356.40	-1	0.	-V	2.12	3.80	
7356.76	-3		Fe	4.62	6.30	
7357.097	3		Ti?p	1.05	2.73	
			Atm			
7357.739	1	4	Ti	1.44	3.11	
7358.26	-3		⊙?			
7358.856	1		Atm?			
			⊙?			

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7359.983	-3		Fe p	4.97	6.65	
7360.347	4		Atm			
7360.70		-3	⊙			
7361.029	1		Atm			
7361.550	1	3	Al	4.00	5.68	
			Ti p	2.24	3.92	
7361.782	-3		⊙			
7361.994	-3					
7362.291	1	2	Al	4.00	5.68	
7362.568	-1		⊙?			
7362.95	-3N		⊙?			
7363.742	5		Atm			
7363.916	0	ob	Fe	4.93	6.61	
7364.106	-1	5	Ti	1.42	3.10	
7364.38	-3N		Atm?			
7364.75	-2N		⊙			
7365.305	0		Atm			
7365.70	1ns		⊙?			
			Atm			
7366.036	-3		Atm?			
7366.367	0		Fe	4.62	6.29	
7366.602	-2	5N	Atm			
			Ti	1.42	3.10	
7366.83	-2					
7367.21	-3N		⊙			
7367.76	-3N		⊙?			
7368.468	4		Atm			
7369.206	5		Atm			
7369.60	-3					
7369.88	-3		⊙?			1
7370.119	2	0d?	Atm-			
			Fe	4.71	6.39	
7370.798	-1		Atm			
7371.496	3		Atm			
7372.383	-3		Atm?			
7373.011	2N	0N	Si-	5.96	7.63	
			Fe p	2.27	3.94	
7373.25	-3N					
7373.622	0		Atm			
7374.29	-2N	1N	⊙			24
7374.59	-2N		Atm			
7375.251	2N	3N	⊙ Atm			
7375.932	-3		⊙			
7376.275	-2	ob?				
7376.494	2	ob?	FeII			
			Fe			
7377.01	-3		⊙			
7377.57	-3		⊙			
7377.865	1		Atm			
			⊙?			
7378.332	1		Atm			
7378.77	-3		⊙?			1
7379.15	-3		Atm?			1
7379.40	-3		Atm?			1
7379.65	-3		Atm?			1
7380.10	-3					1
7380.492	-1		Atm			
7380.73	-2N		⊙?			
7381.342	-2N		⊙			
7381.504	-1N		Atm			
7381.942	1	-2	Ni	5.34	7.01	
7382.357	0N		⊙?			
7382.614	0	0	Fe p	2.68	4.35	
7382.78	-3					1
7382.933	-1	-1	Fe	4.59	6.26	
7383.08	-3		Atm?			
7383.350	0		Atm			
7383.54	-3		Atm?			1
7383.721	3		Atm			
7384.45	-3					
7384.77	-3					1
7385.00	-3		Fe p	5.04	6.71	
7385.244	3	3	Ni	2.73	4.40	
7385.51	-3N		Fe p	4.77	6.45	
7385.89	-2N		⊙?			
7386.201	-1		Ni	5.32	6.99	
7386.336	7	4	Fe	4.89	6.56	
7386.66	-3		Atm?			
7387.10	-2N	2	⊙			
7387.700	9N	5	Mg	5.73	7.40	
7388.605	-1N	0N	Atm-			
			Co?	2.71	4.38	
7389.391	8d	5	-Fe	4.28	5.95	
7389.88	-2		Atm?			
7390.241	2		Atm			
7390.88	-3d?		Atm?			
7391.270	2		Atm			
7391.48	-3		Atm?			1
7391.717	1		Atm			
			⊙			
7392.13	-2		Si?p	6.10	7.77	24
7392.654	-3N					
7393.111	-3		⊙?			
7393.609	7	5	Ni	3.59	5.26	
7395.539	-1		Atm			
7395.81	-3					
7396.053	2		Atm			
7396.312	-3					
7396.526	-1	ob?	Fe	4.97	6.64	
7396.752	0		Atm?			
7397.123	1		Atm			
7397.535	-3		⊙			
7397.939	-1		⊙			
7398.19	-2		Atm?			1
7398.52	-3N		⊙?			
7398.76	-3N		Fe p	3.42	5.08	1
7398.96	-3N		Fe p	4.97	6.64	
7399.308	-2		Atm?			
7400.188	5	8	Cr	2.89	4.55	
7400.48	-3					
7400.851	-3		Fe p	2.60	4.26	
7401.134	-2	-3	Ni	5.34	7.01	
7401.46	-3		Atm?			
7401.691	2	2	Fe	4.17	5.84	
7401.96	-3		Atm?			
7402.155	-2		⊙?			
7403.33	-3		⊙?			1
7403.857	-1		Atm			

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7405.17	-3N		Atm?			1
7405.790	7N	0	Si	5.59	7.26	
7406.289	-2		Atm			
7406.61	-3		Atm?			
7407.06	-3		Atm?			1
7407.27	-3		Atm?			
7407.33	-3		Atm?			
7408.135	-2		Atm?			
7408.43	-3		Atm?			
7408.78	-3		Atm?			
7409.100)	5N	-2N	Si	5.59	7.26	
7409.352)	6	1	Ni	3.78	5.45	
7409.99	-3		⊙?			
7410.324	-3					
7410.733	-2		Atm			
7411.162	8	7	Fe	4.26	5.93	
7413.06	-3N		⊙?			
7413.52	-3N		Atm?			1
7414.00	-3N		⊙?			1
7414.514	5	5	Ni	1.98	3.64	
7414.93	-3N		⊙?			
7415.193)	-1	-1	Fe p	4.97	6.63	
7415.363)	2N	ob?	Si	5.59	7.26	
7415.68	-3					
7415.958	8N	2N	Si	5.59	7.26	
7416.329	-3		⊙?			
7417.06	-3		Ti p	1.06	2.73	
7417.39	-1N	1N	Co	2.03	3.70	
7417.96	-3		Atm?			
7418.330	-3		Fe p	4.12	5.79	
7418.672	4	2	Fe	4.12	5.79	
7419.00	-3N					1
7419.31	-3N		Ni	5.47	7.13	
7419.670	-3N		⊙?			
7420.241	-3	-2	Fe p	5.06	6.73	
7421.030	-1					
7421.32	-3					1
7421.560	0	ob	Fe	4.62	6.28	
7421.86	-3N		⊙?			
7422.286	7	5	Ni	3.62	5.28	
7422.77	-3		⊙?			
7423.16	-3	-1	Ti	1.44	3.10	
7423.509	8N	2	Si	5.59	7.26	
			(N)	10.28	11.94	
7423.842	-2					
7424.27	-3N		Atm?			
7424.647	ON	ON	Si	5.59	7.26	
			Atm			
7425.048	-2N		⊙			
7425.560	-1		Atm			
7425.850	-1		Atm			
7426.47	-3		Atm?			1
7427.562	0	-1	⊙			
7430.31	-3		⊙?			
7430.553	-1	1	Fe	2.58	4.24	
7430.846	0	ob	Fe	(4.59	6.25	
				(5.46	7.12	
7431.19	-3N		Si?p	6.20	7.86	
7431.599	-1	-1				
7431.97	-3N	-1	Ti p	1.73	3.39	
			Fe p	4.62	6.28	
7432.29	-2	ob	⊙			
7432.44	-3)	-3N	⊙?			
7433.06	-3)		⊙?			
7433.460	-2N	-2nl	-Ni	5.39	7.05	
7434.58		-1	⊙			1
7435.08		-3	⊙			1
7435.584	2	-1N	⊙			
7435.95	-3		⊙?			
7437.07	-3		⊙?			
7437.608	-1		⊙			
7437.87	-2N		Atm?			
7438.38	-3N		⊙			1
7439.24		-2N	⊙			1
7439.87		0	Zr?	0.54	2.20	1
7440.253	-2N		Atm?			
7440.58	-3	3	Ti	2.25	3.90	
7440.70	-2N					
7440.919	4	2	Fe	4.89	6.55	
7441.81	-3		⊙?			
7442.23	-3N		N	10.29	11.94	
7442.47	-3N	-1?	⊙?			1
7442.71	-3		⊙?			1
7443.026	2	1	Fe	4.17	5.83	
7443.25	-2		Fe p	5.06	6.72	
7444.47	-3N		⊙?			
7445.758	9	7	Fe	4.24	5.90	
7446.99	-3		Atm?			1
7447.400	2	3	Fe	4.93	6.59	
7447.912	0	ob	-Fe p	5.50	7.16	
7448.20	-3		⊙?			
7448.56	-3		Atm?			1
7448.92	-3		⊙?			
7449.338	0	-1	FeII	3.87	5.53	
7450.33	-3NN		YII	1.74	3.40	
7451.478	-3NN		⊙?			
7452.110	-1	ob	Fe p	5.04	6.70	
7452.96	-3N		SaII			
7453.81	-3N		Atm?			1
7454.004	0	-1	Fe	4.17	5.82	
7454.45	-3		Atm?			
7455.389	-1	ob	Si p	6.10	7.75	
7456.35	-3	1?	-Ti p	0.81	2.47	
7457.354	-2N		⊙?			
7458.00	-3		⊙?			
7458.384	-2		Atm?			
7458.78	-3		Atm?			
7459.07	-3		⊙?			
7459.39	-3		Atm?			
7459.86	-3		Atm?			1
7460.25	-3		Fe p	3.24	4.89	
7460.549	-2		⊙			
7461.25	-3		Fe p	5.48	7.14	
7461.527	1	3	Fe	2.55	4.20	
7462.342	8	10	Cr	2.90	4.55	
			(FeII)	3.87	5.53	
7462.96	-3		⊙?			
7463.19	-3N		Atm?			

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7463.395	-1	ob?	Fe p	5.04	6.70	
7463.99	-3	-1	⊙			
7464.268	0	ob	⊙			
7465.85	-3NN		⊙			
7466.533	-2	ONN	Ti p-	1.73	3.38	
7466.99	-3		Atm			1
7467.31	-3		Atm			
7467.51	-3		Atm?			1
7468.27	-2N	ob	N	10.29	11.94	
7468.927	-3	-1	⊙			
7470.05		1	Ti p	0.83	2.48	1
7470.61	-3		Atm?			1
7470.98	-3		Atm?			
7471.34	-2	0	Ti p	0.81	2.46	
7471.757	-2		Fe p	2.72	4.37	
7472.755	-1		⊙			
7473.563	0	-1	Fe	4.59	6.24	
7474.513	-3N		Fe p	3.91	5.56	
				3.97	5.63	
7474.92	-3	-1N	Ti	1.74	3.39	1
7475.87	-3N	-1	⊙			
7476.149	-1	ob				
7476.376	-1	Ow	Fe	4.77	6.43	
7476.87	-3		Fe p	4.17	5.82	
7477.595	ON	ON	Fe p	3.86	5.52	24
7478.84	-3	-2N	Fe p	3.35	5.00	
7479.10	-3	-2	⊙			
7479.701	-2	ob	FeIIp	3.87	5.52	
7479.98	-3		Atm?			
7480.56	-3		Atm?			
7480.816	-2		⊙?			
7481.478	-2	-3	Ni	5.47	7.12	
7481.736	-3		Fe p	2.75	4.40	
7481.934	-2	-1N?	Fe	4.77	6.42	
7482.213	-1	-1	Fe p	5.06	6.71	24
7482.65	-3		Atm?			
7482.871	-2N		⊙			
7483.415	-2N		LaII?	0.13	1.77	
7484.07	-3		Atm?			
7484.308	-1	ob?	Fe p	5.06	6.71	
7484.68	-3		Cr?			
7485.00	-3		⊙?			1
7485.14	-3N		⊙?			
7486.118	-3		Fe p	3.87	5.52	
7486.667	-2		⊙			
7488.00	-3		⊙			
7488.706	-3		Ni	3.82	5.46	
7488.92	-3		Atm?			
7489.569	-3	3	Ti	2.24	3.89	
7490.84	-3		Fe p	3.29	4.93	
7491.08	-3		⊙			
7491.652	4	5	Fe	4.28	5.93	
7492.02	-3		Atm?			
7492.333	-3N		⊙?			
7492.941	-2		⊙?			
7493.11	-3		Atm?			
7493.58	-3		⊙?			
7493.940	-2N		⊙			
7494.404	-1	ob	⊙			
7494.74	-3		Fe p	1.55	3.20	
7495.077	8	8	Fe	4.20	5.85	
7495.50	-3		⊙?			
7495.66	-3		Fe p	4.97	6.61	
7496.12	-2	3	Ti	2.23	3.87	
7497.44	-3N		⊙?			
7498.22	-3		Atm?			
7498.535	1	1	Fe	4.12	5.77	
7498.78	-3		⊙?			1
7499.18	-3N		⊙?			
7500.242	-2N		⊙			
7500.55	-3		⊙?			
7500.94	-3		Atm?			
7501.280	-2		Fe p	4.17	5.81	
7501.76	-3N		Ni?	5.57	7.22	
7502.78	-3N	1	⊙			
7503.31	-3N		⊙			
7503.94	-3		⊙			1
7504.276	-2		⊙			
7504.61	-3		Atm?			1
7504.940	-2N	ob?	⊙			24
7505.19	-3		⊙?			1
7506.030	1	1N	Fe p	5.04	6.69	
7506.73	-3N		Atm?			
7507.273	4	4	Fe	4.40	6.04	
7508.60	-3N		Fe p	4.97	6.61	
7509.46	-3N		Atm?			1
7511.031	11	11	Fe	4.16	5.80	
7511.51	-3		⊙?			
7511.80	-3		⊙?			1
7512.166	-2		Fe p	2.27	3.91	
				4.12	5.77	
7512.77	-3		⊙?			
7513.16	-3		⊙?			1
7513.76	-3		Atm?			1
7514.205	0	-1	⊙			
7514.54	-3		Atm?			1
7515.10	-3N		⊙?			
7515.43	-3N		⊙?			
7515.60	-3		Atm?			1
7515.837	0	ob	FeII	3.89	5.53	
7516.21	-3		⊙?			
7516.623	-3		⊙?			
7516.82	-2N		⊙?			
7517.27	-3		Atm?			1
7517.83	-3N		Atm?			1
7518.66	-3N		⊙?			
7519.89	-3N		Fe			1
7521.06	-2N	-3N	Ni	5.49	7.13	
7521.58	-3N		⊙?			
7522.19	-3		Atm?			1
7522.778	5	5	Ni	3.64	5.28	
7523.217	-1	-2	⊙			9
7523.54	-3		Atm?			1
7523.93	-3		⊙?			1
7524.17	-3		Atm?			1
7524.75	-3		Atm?			1
7525.118	4	5	Ni	3.62	5.26	
7525.50	-3d?		Atm?			1

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7525.56	-3		Atm?			1
7526.10	-3N		⊙?			
7526.43	-3		⊙?			1
7526.67	-3N		Fe p	5.48	7.12	1
7527.26	-3N		⊙?			
7527.90	-3		Atm?			1
7528.18	-2	-1	Fe p	5.01	6.65	
7528.41	-3		⊙?			1
7528.90	-3N		Atm?			1
7529.48	-3N		⊙?			1
7530.58	-2		Atm			
7531.153	6	7	Fe	4.35	5.99	
7531.789	-1	ob	⊙			
7532.12	-3		⊙?			1
7532.58	-3N		Atm?			1
7533.04	-3		Atm?			1
7533.373	-1	-1	FeII-	3.89	5.52	
7534.28	-3		⊙			1
7534.85	-3		FeIIp	3.93	5.57	i
7535.61	-3N		Atm?			1
7537.02	-3		Atm?			1
7537.475	-3		Fe?p	4.06	5.70	
7537.96	-3		Fe p	5.50	7.14	1
7539.31	-3		Atm?			1
7539.52	-3		Atm?			
7539.99	-3		Atm?			
7540.444	0	1	Fe p	2.72	4.35	
7541.02	-3		Atm?			1
7541.19	-3		Atm?			
7541.57	-2N		Fe	3.93	5.56	
7541.920	0	-1	⊙			
7545.660	-2N		Ni	5.59	7.23	
7546.183	2	3	Fe			
7546.63)	-3N		⊙?			
7547.00}	-3NN		⊙?			1
7547.38)	-3N		⊙?			1
7547.904	0	-1	Fe p	5.08	6.71	
7548.37	-3		Atm?			1
7549.08	-3N		⊙?			1
7549.82	-3N		⊙?			1
7550.23	-3		⊙?			1
7551.108	-1	-2	Fe p	5.06	6.70	
7552.501	0	0	Ni p	5.59	7.22	
7552.795	-2	-1	Fe p	5.01	6.65	
			Atm?			
7553.42	-3					
7553.953	-2N		Co?	3.93	5.57	
7554.841	ON	ON	⊙			
7555.607	6	6	Ni	3.83	5.46	
7557.695	-2		⊙			
7558.16	-3		⊙?			
7558.87	-3		⊙?			
7559.36	-3		Atm?			1
7559.705	2ns	2d	Fe	5.04	6.67	
			Ni	5.50	7.13	
7560.19	-3		Atm?			1
7560.52	-3		Atm?			1
7560.96	-3		Atm?			1
7561.60	-3		Atm?			1

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7562.62	-3		⊙?			1
7563.016	1	1	Fe	4.81	6.45	
7563.66	-3		⊙?			1
7563.91	-3N		Atm?			1
7564.498	-2N		⊙			
7565.21	-3N		⊙?			
7565.534	-2NN		⊙			
7566.34	-3N		⊙?			1
7567.170	2NN	1NN	⊙			
7567.61	-3		⊙			
7568.60	-3		⊙?			1
7568.906s	5	8	Fe	4.26	5.90	
7569.556	-1	-2	⊙			
7569.88	-2		⊙?			1
7570.22	-3		⊙?			1
7570.79	-3d?		⊙?			1
7571.40	-3		⊙?			
7572.38	-3		⊙?			1
7573.18	-3					1
7573.426	0	0	Fe?			
7573.72	-3		Fe p	3.97	5.60	
7574.048s	5	5	Ni	3.82	5.45	
7574.36	-3		⊙?			
7574.58	-3N		⊙?			1
7574.88	-3N		⊙?			1
7575.39	-3N	-2N	⊙			
7576.22	-3		Atm			1
7577.30		-1	⊙			1
7578.47	-2		Atm			
7578.787	-2N	ob?	⊙			
7579.08		-2N	⊙			
7580.28		0	Ti?	2.22	3.85	1
7582.120	0	0	Fe p	4.93	6.56	
7582.48	-3		⊙?			
7582.70	-3		Atm?			1
7583.12	-3N		⊙?			
7583.33	-3		Atm?			1
7583.796	4	4	Fe	3.00	4.63	
7584.29	-3		⊙?			1
7584.77	-3		Atm?			
7586.027s	8	8	Fe	4.29	5.92	
7586.52	-3		⊙?			1
7586.92	-3N		Atm?			1
7588.310	1	1	Fe p	5.01	6.64	
7588.849	-1	-1	⊙			
7590.18	-2N		⊙			
7590.76	-3		Atm			
7591.32	-2N		⊙			
7591.90	-3		Atm?			
7593.695	10		Atm O_2	16-16	0, 0	26
7593.850	2		Atm O_2	16-16	0, 0	
7593.997	10		Atm O_2	16-16	0, 0	
7594.287	1		Atm O_2	16-18	0, 0	26
7594.507	12		Atm O_2	16-16	0, 0	
7594.974	6		Atm O_2	16-16	0, 0	26
7595.235	14		Atm O_2	16-16	0, 0	26
7595.590	1		Atm O_2	16-18	0, 0	26
7595.770s	12		Atm O_2	16-16	0, 0	
7596.228	15		Atm O_2	16-16	0, 0	

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	Data	Notes
7596.503	12		Atm O_2	16–16	0, 0	
7596.768	–3		Atm O_2	16–18	0, 0	27
7596.975	–4		Atm O_2	16–18	0, 0	
7597.438	30		Atm O_2	16–16	0, 0	26
7598.006	1		Atm O_2	16–18	0, 0	26
7598.650	50		Atm O_2	16–16	0, 0	
7598.847			Atm O_2	16–16	0, 0	
7599.228	0		Atm O_2	16–18	0, 0	
7599.462S	0		Atm O_2	16–18	0, 0	
7599.550	–4		Atm O_2	16–17	0, 0	
7600.066	25		Atm O_2	16–16	0, 0	
7600.493	25		Atm O_2	16–16	0, 0	
7601.127	0		Atm O_2	16–18	0, 0	
7601.240	–4		Atm O_2	16–17	0, 0	
7601.470	0		Atm O_2	16–18	0, 0	
7601.697	25		Atm O_2	16–16	0, 0	
7602.036	0		Atm O_2	16–18	0, 0	
7602.363	32		Atm O_2	16–16	0, 0	
7602.995S	0		Atm O_2	16–18	0, 0	
7603.216	0		Atm O_2	16–18	0, 0	
7603.556	30		Atm O_2	16–16	0, 0	
7604.013	0		Atm O_2	16–18	0, 0	
7604.453	34		Atm O_2	16–16	0, 0	
7605.076	0		Atm O_2	16–18	0, 0	
7605.186	0		Atm O_2	16–18	0, 0	
7605.635	31		Atm O_2	16–16	0, 0	
			(Fe)	5.01	6.63	
7606.198	1		Atm O_2	16–18	0, 0	
7606.238	1		Atm O_2	16–18	0, 0	
7606.767	33		Atm O_2	16–16	0, 0	
7607.366	2		Atm O_2	16–18	0, 0	26
7607.933	30		Atm O_2	16–16	0, 0	
7608.530	2		Atm O_2	16–18	0, 0	
7608.586	2		Atm O_2	16–18	0, 0	
7608.82	–4		Atm O_2	16–17	0, 0	
7608.91	–4		Atm O_2	16–17	0, 0	
7609.302	30		Atm O_2	16–16	0, 0	
7609.746	1		Atm O_2	16–18	0, 0	
7609.868	1		Atm O_2	16–18	0, 0	
7610.06	–4		Atm O_2	16–17	0, 0	
7610.455	25		Atm O_2	16–16	0, 0	
7611.007	0		Atm O_2	16–18	0, 0	
7611.194S	0		Atm O_2	16–18	0, 0	
7611.364	–4		Atm O_2	16–17	0, 0	
7611.584	–4		Atm O_2	16–17	0, 0	
7612.060	25		Atm O_2	16–16	0, 0	
7612.314	0		Atm O_2	16–18	0, 0	
7612.578	–1		Atm O_2	16–18	0, 0	
7612.745	–4		Atm O_2	16–17	0, 0	
7613.194	20		Atm O_2	16–16	0, 0	
7613.705	–1		Atm O_2	16–18	0, 0	
7614.026	–1		Atm O_2	16–18	0, 0	
7614.15	–4		Atm O_2	16–17	0, 0	
7614.516	–2N	0	Ti	2.23	3.85	
7615.061	20		Atm O_2	16–16	0, 0	
7615.552	–2		Atm O_2	16–18	0, 0	
7616.146	17		Atm O_2	16–16	0, 0	
7616.980S	8	9	Ni	3.64	5.26	
7617.245	–1	–2	Fe p	5.04	6.66	
7617.985	–1	–1	Fe p	4.17	5.79	
7619.214S	4	5	Ni	3.66	5.28	
7619.698	0		Atm O_2	16–18	0, 0	
7620.077	0		Atm O_2	16–18	0, 0	
7620.322	–4		Atm O_2	16–17	0, 0	
7620.513	5	6	Fe	4.71	6.33	
7620.996	20		Atm O_2	16–16	0, 0	
7621.323	0		Atm O_2	16–18	0, 0	
7621.802S	0		Atm O_2	16–18	0, 0	
7621.988	–4		Atm O_2	16–17	0, 0	
7622.29	–3		$\odot$			1
7622.503	–4		Atm O_2	16–17	0, 0	
7623.012	0		Atm O_2	16–18	0, 0	
7623.288	30		Atm O_2	16–16	0, 0	
7623.552	0		Atm O_2	16–18	0, 0	
7623.715	–4		Atm O_2	16–17	0, 0	
7624.500	32		Atm O_2	16–16	0, 0	
			(Ni)	5.61	7.23	
7625.354S	1		Atm O_2	16–18	0, 0	
7625.475	–4		Atm O_2	16–17	0, 0	
7626.157	–3		Atm O_2	16–17	0, 0	
7626.524	1		Atm O_2	16–18	0, 0	
7627.054	32		Atm O_2	16–16	0, 0	
7628.225	35		Atm O_2	16–16	0, 0	
7629.092	2		Atm O_2	16–18	0, 0	
7629.196	–3		Atm O_2	16–17	0, 0	
7629.988	–3		Atm O_2	16–17	0, 0	
7630.245	2		Atm O_2	16–18	0, 0	
7631.016	35		Atm O_2	16–16	0, 0	
7632.168	38		Atm O_2	16–16	0, 0	
7633.036	3		Atm O_2	16–18	0, 0	
7633.131	–4		Atm O_2	16–17	0, 0	
7634.052	–4		Atm O_2	16–17	0, 0	
7634.170	3		Atm O_2	16–18	0, 0	
7635.192	35		Atm O_2	16–16	0, 0	
7636.328	38		Atm O_2	16–16	0, 0	
7637.183	3		Atm O_2	16–18	0, 0	
7637.276	–4		Atm O_2	16–17	0, 0	
7638.306S	3		Atm O_2	16–18	0, 0	27
7639.339	3		Atm O_2	16–18	0, 0	
7639.585	32		Atm O_2	16–16	0, 0	
7640.457	3		Atm O_2	16–18	0, 0	
7640.707	35		Atm O_2	16–16	0, 0	
7641.535	2		Atm O_2	16–18	0, 0	
7641.644	–4		Atm O_2	16–17	0, 0	
7642.651	2		Atm O_2	16–18	0, 0	
7642.786	–4		Atm O_2	16–17	0, 0	
7643.793	1		Atm O_2	16–18	0, 0	
7644.200	30		Atm O_2	16–16	0, 0	
7644.900	1		Atm O_2	16–18	0, 0	
7645.312	32		Atm O_2	16–16	0, 0	
7646.098	1		Atm O_2	16–18	0, 0	
7646.209	–3		Atm O_2	16–17	0, 0	
7647.202S	1		Atm O_2	16–18	0, 0	
7647.460	–3		Atm O_2	16–17	0, 0	
7647.84	–2NN		Fe p	4.43	6.04	
7648.12	–3					1
7648.454	0		Atm O_2	16–18	0, 0	
7648.580	–4		Atm O_2	16–17	0, 0	

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
7649.035	20		Atm O_2	16–16	0, 0	
7649.553S	-1		Atm O_2	16–18	0, 0	
7650.135	22		Atm O_2	16–16	0, 0	
7650.894	-1		Atm O_2	16–18	0, 0	
7650.975	2	2	Fe p	2.68	4.29	
			(Atm O_2)	16–17	0, 0	
7651.50	-3		⊙			
7651.963S	0		Atm O_2	16–18	0, 0	
7652.383	-4		Atm O_2	16–17	0, 0	
7653.343	-1		Atm O_2	16–18	0, 0	
7653.47	-4		Atm O_2	16–17	0, 0	
7653.757	2		Fe	4.77	6.39	
7654.094	16		Atm O_2	16–16	0, 0	
7654.428	-1	ON	Atm O_2	16–18	0, 0	
			Ti	2.24	3.85	
7655.182	16		Atm O_2	16–16	0, 0	
7655.48	-1N	ob?	FeII	3.87	5.49	
7655.847	-2		Atm O_2	16–18	0, 0	
7656.00	-4		Atm O_2	16–17	0, 0	
7656.53	-3		⊙			1
7656.940	-2		Atm O_2	16–18	0, 0	
7657.26	-3		Ni	5.39	7.00	
7657.606S	9N	9N	Mg	5.09	6.70	
7658.03	-3					1
7658.420	-2		Atm O_2	16–18	0, 0	
7658.60	-4		Atm O_2	16–17	0, 0	
7659.148	-1N		⊙			
7659.370	12		Atm O_2	16–16	0, 0	
7659.91	3	ob	⊙			
7660.454	12		Atm O_2	16–16	0, 0	
7661.05	-3		Atm O_2	16–18	0, 0	
7661.198	6	6	Fe	4.24	5.85	
7661.48	-3		Fe p	5.06	6.67	
7662.122	-3		Atm O_2	16–18	0, 0	
7662.84	-4		Atm O_2	16–17	0, 0	
7663.22	-3		⊙?			1
7663.726	-4		Atm O_2	16–18	0, 0	
7663.90	-4		Atm O_2	16–17	0, 0	
7664.18	-3		Fe p	4.81	6.42	
7664.294	7	8	Fe	2.98	4.59	
7664.872	12	20	K	0.00	1.61	
			Atm O_2	16–16	0, 0	
7665.944S	10		Atm O_2	16–16	0, 0	
7666.44	-4		Atm O_2	16–18	0, 0	
7666.669	-4		Atm O_2	16–17	0, 0	
7667.518	-4		Atm O_2	16–18	0, 0	
7668.399	-4		Atm O_2	16–17	0, 0	
7669.233	-4		Atm O_2	16–18	0, 0	
7669.47	-4		Atm O_2	16–17	0, 0	
7669.668	2	1	⊙			
7670.31	-4		Atm O_2	16–18	0, 0	
7670.600	10		Atm O_2	16–16	0, 0	
7671.669S	10		Atm O_2	16–16	0, 0	
7672.09	-4		Atm O_2	16–18	0, 0	40
7672.32	-4		Atm O_2	16–17	0, 0	
7673.127	-4		Atm O_2	16–18	0, 0	
7674.183	-4		Atm O_2	16–17	0, 0	
7674.962	-4		Atm O_2	16–18	0, 0	
7675.240	-4		Atm O_2	16–17	0, 0	
7676.026	-4		Atm O_2	16–18	0, 0	
7676.565S	9		Atm O_2	16–16	0, 0	
7677.619S	9		Atm O_2	16–16	0, 0	
7678.60	-3		Atm?			1
7678.953	-4		Atm O_2	16–18	0, 0	
7679.60	-3nl		S	7.83	9.44	
7680.267	6N	4N	Si	5.84	7.44	
			(Mn)	5.47	7.07	
7680.912	-4		Atm O_2	16–18	0, 0	
7681.953	-4		Atm O_2	16–18	0, 0	
7682.758S	8		Atm O_2	16–16	0, 0	
7683.802S	8		Atm O_2	16–16	0, 0	
7684.331	-4		Atm O_2	16–16	1, 1	
7684.617	-2		Atm?			
7684.964	-4		Atm O_2	16–16	1, 1	
			Atm O_2	16–18	0, 0	
7685.12	-3NN	-2NN	⊙			1
7685.281	-4		Atm O_2	16–16	1, 1	
7685.629	-4		Atm O_2	16–16	1, 1	
7685.764	-4		Atm O_2	16–16	1, 1	
7686.13	-3		S	7.83	9.44	
7686.203	-4		Atm O_2	16–16	1, 1	
7686.830	-4		Atm O_2	16–16	1, 1	
7687.034	-4		Atm O_2	16–16	1, 1	
7687.51	-3d		⊙?			1
7688.127	-3		Atm O_2	16–16	1, 1	26
7688.40	ON	ob?	⊙			
7689.04	-3		Fe p	5.08	6.68	1
7689.177	6		Atm O_2	16–16	0, 0	
7689.387	-4		Atm O_2	16–16	1, 1	
7689.703	-3N		Atm O_2	16–16	1, 1	
7690.218S	6		Atm O_2	16–16	0, 0	
7690.939	-4		Atm O_2	16–16	1, 1	
7691.487	-3		Atm O_2	16–16	1, 1	
7691.569	8N	7N	Mg	5.73	7.33	
7692.046	-3NN		⊙			
7692.722	-3		Atm O_2	16–16	1, 1	
7693.530	-3		Atm O_2	16–16	1, 1	
7694.748	-3		Atm O_2	16–16	1, 1	
7695.62	-1N		⊙			1
7695.838S	4		Atm O_2	16–16	0, 0	
7696.869S	4		Atm O_2	16–16	0, 0	
			(S)	7.84	9.44	
7696.996	-3		Atm O_2	16–16	1, 1	
7698.322	-3		Atm O_2	16–16	1, 1	
7698.977	11	16	K	0.00	1.60	
7699.506	-3		Atm O_2	16–16	1, 1	
7701.078	-3		Atm O_2	16–16	1, 1	
7702.240	-3		Atm O_2	16–16	1, 1	
7702.739	3		Atm O_2	16–16	0, 0	
7703.759	3		Atm O_2	16–16	0, 0	34
7704.076	-3		Atm O_2	16–16	1, 1	
7705.207	-3		Atm O_2	16–16	1, 1	
7709.871	-1		Atm O_2	16–16	0, 0	
7710.099	-4		Atm O_2	16–16	1, 1	
7710.367	3	3	Fe	4.20	5.80	
7710.874	-1		Atm O_2	16–16	0, 0	

I A	Intensity		Ident	E P		Notes
	Disk	Spot		or Band	Data	
7711.731	2	1	FeII	3.89	5.49	
7712.416	-3		Atm O_2	16-16	1, 1	
			(Mn)	5.50	7.10	
7712.66	-2NN⊙		Co	2.53	4.13	
7713.658	-3		Atm O_2	16-16	1, 1	
7714.310S	6	8	Ni	1.93	3.53	
7714.59	-3		⊙			1
7715.219	-2	-3	⊙			
7715.591	2	1	Ni	3.68	5.28	
7716.251	-4		Atm O_2	16-16	1, 1	
7717.251	-2		Atm O_2	16-16	0, 0	
7717.450	-3		Atm O_2	16-16	1, 1	
7718.257	-2		Atm O_2	16-16	0, 0	
7719.046	0N	-1N	Fe p	5.01	6.61	
7720.304	-3		Atm O_2	16-16	1, 1	
7720.72	-1		Fe p	5.06	6.66	
7721.14	-3		⊙			1
7721.482	-3		Atm O_2	16-16	1, 1	
7722.64	-1N	-2N	Mg p	5.92	7.52	
7723.210	2	3	Fe	2.27	3.87	
7724.586	-3		Atm O_2	16-16	1, 1	
7724.880	-4		Atm O_2	16-16	0, 0	
7725.17	-1		⊙			1
7725.746	-3		Atm O_2	16-16	1, 1	
7725.862	-4		Atm O_2	16-16	0, 0	
7726.75	-3N		⊙			1
7727.616S	5	6	Ni	3.66	5.26	
7729.101	-3		Atm O_2	16-16	1, 1	
7729.40	-3NN		⊙			
7729.98	-3N		⊙			
7730.254	-3		Atm O_2	16-16	1, 1	
7730.97	-3N		⊙			1
7732.49	-3N		⊙			1
7732.746	-4		Atm O_2	16-16	0, 0	
7733.12	-3		Mn	5.36	6.96	1
7733.738	-2	-1	Atm O_2	16-16	0, 0	
			Fe p	5.04	6.64	
7733.854	-3		Atm O_2	16-16	1, 1	
7734.40	-3		Mn?	5.52	7.11	1
7734.995	-3		Atm O_2	16-16	1, 1	
7735.94	-2		Ni?	5.27	6.86	1
7737.65	-1NN		Fe p	4.40	5.99	1
7738.848	-4		Atm O_2	16-16	1, 1	
7739.978	-4		Atm O_2	16-16	1, 1	
7740.50	-3		Atm?			1
7741.44	-1NN		⊙			1
7742.722	9	7	Fe	4.97	6.56	
7744.080	-4		Atm O_2	16-16	1, 1	
7745.202	-4		Atm O_2	16-16	1, 1	
7745.521	0	0	Fe p	5.06	6.66	
7746.605	0	0	Fe p	5.04	6.64	
7747.58	-3		⊙?			1
7748.284S	6	8	Fe	2.94	4.53	
7748.894	5	6	Ni	3.69	5.28	
7749.554	-4		Atm O_2	16-16	1, 1	
7750.670	-4		Atm O_2	16-16	1, 1	
7751.116S	2	1	Fe	4.97	6.56	
7751.99	-3		Atm?			
7755.275	-4		Atm O_2	16-16	1, 1	
7755.36	-2NN	-2NN				11
7756.378	-4		Atm O_2	16-16	1, 1	
7759.30	-1NN	0NN	⊙			1
7760.641	0	ob?	⊙			
7761.232	-4		Atm O_2	16-16	1, 1	
7762.334	-4		Atm O_2	16-16	1, 1	
7764.66	-1		Mn?	5.35	6.94	1
7765.19	-3NN		⊙			
7766.62	-3		Fe p	3.93	5.52	1
7767.458	-4		Atm O_2	16-16	1, 1	
7768.513	-4		Atm O_2	16-16	1, 1	
7771.31	-3		Atm?			1
7771.954	5N	0N	O	9.11	10.69	23
7772.68	-3N		⊙?			1
7774.177	5N	0N	O	9.11	10.69	23
7775.395	3N	-2N	O	9.11	10.69	23
7780.568S	8	9	Fe	4.45	6.04	
7788.933S	5	7	Ni	1.94	3.53	
7795.99	-3		⊙?			1
7797.588S	5	6	Ni	3.88	5.46	
7798.86	-3		Fe p	3.00	4.59	1
7799.21	-2		⊙			
7800.000	5N	2N	Si	6.15	7.74	
7800.29	-3	4	Rb	0.00	1.58	1
7801.16	-3N		⊙			1
7802.51	0	0	Fe p	5.01	6.65	
7802.86	-3		Atm?			1
7807.916S	4	4	Fe?-			
			Fe p	4.97	6.55	
7810.815	0	-2	Fe p	5.01	6.59	
7811.16	1N	-2N	Mg p	5.92	7.50	
7813.67	-3NN		Fe?p	5.08	6.66	1
7815.82	-3NN		⊙			1
7817.22	-3		⊙			1
7820.81	-1		Fe p	4.28	5.85	
7821.73	-1N		⊙			1
7826.50	-3		Atm			1
7826.77	0	0	Ni	3.68	5.26	
7832.208S	9	10	Fe	4.42	5.99	
7835.317	3N	4N	Al	4.00	5.58	
7836.130S	4N	5N	Al	4.00	5.58	
7837.06	-2		⊙?			1
7838.15	-1		FeIIp	3.95	5.52	
7838.89	-3		⊙?			1
7839.64	-2		⊙?			1
7841.37	-3		FeIIp	3.89	5.46	1
7843.04	0N	ob?	⊙			
7844.569	0	-1	Fe	4.81	6.39	
7845.27	-2N		Atm			
7846.272	0		Atm			
7846.52	-1		Atm?			1
			Fe?p	5.00	6.58	
7848.74	-1		Atm			
7849.38	-3	-1	Zr	0.68	2.26	1
7849.984	4N	-1N	-Si	6.16	7.74	
7850.88	-3d?	-2?	⊙			1,24
7851.95	-3		⊙?			1

I A	Intensity Disk	Intensity Spot	Ident	E P or Band Data		Notes
7852.71	-2N	3d	Ti p	0.84	2.42	9
7853.51	-2ns		Atm			
7854.02	-2		Atm			
7854.692	-1		Atm			
7855.16	-2		Ni	4.52	6.09	
7855.405	1	-1	Fe	5.04	6.61	
7855.822	-2	ob				
7858.30	-3		Atm?			
7858.97	-3		Atm?			
7860.76	-2	-3	⊙ Atm			
7861.045	-1	-2	Ni	3.69	5.26	
7861.32	-2		Atm			1,40
7862.28	-3		Atm?			1
7863.193	0		Atm			
7863.799	0	-1	Ni	4.52	6.09	
7864.437S	2		Atm			
7865.71	-2		Atm			
7866.080	3		Atm			
7866.32	-3		Atm			1
7866.710	-2		Atm			
7868.09	-3		Atm			1
7869.635	1	-1	Fe	4.35	5.92	
7869.94	1	2	Zr	0.68	2.25	9
			Atm			
7870.50	0		Atm			
7872.79	2	4	Atm			40
			(CN)		1, 0	
7873.34	-3		CN		1, 0	
7873.96	-3		CN		1, 0	
7874.84	-3		CN		1, 0	1
7875.320	2		Atm			
7876.114	1		Atm			
			(CN)		1, 0	
7876.570	6		Atm			
7876.705	-2		Atm			
7877.059	0	ob	MgII	9.95	11.52	
7877.53	0N		⊙			
			(CN)		1, 0	
7878.89	-3N		CN		1, 0	1
7879.78	-1		Fe	5.01	6.58	
7879.86	1		Atm			16
7880.14	-3		Atm?			1
7880.699	3		Atm			
7880.847	-2		CN		1, 0	
7881.67	0		⊙			1
7881.92	2	0N	Atm			
7882.30	-3		⊙?			1
7882.84	-3		CN		1, 0	1
7884.44	-3		⊙?			1
7885.014S	1	4	Atm			25
			Ti p	0.83	2.40	
			(CN)		1, 0	
7885.72	-2		Atm?			
7886.202	-1		Atm			
7886.802	0		Atm			
7887.117S	3		Atm			
7887.78	-3		CN		1, 0	1
7888.85	-3N		Atm?			1
7889.339	2		Atm			
			(CN)		1, 0	
7890.12	-1N	-1N	Ni	3.88 4.52	5.45 6.08	
7890.420	-1N	-1N	⊙			
7890.99	-2		Atm?			
7891.144	1		Atm			
7891.898	4		Atm			
			(CN)		1, 0	
7893.512S	4		Atm			
7893.62	-3		CN		1, 0	1
7894.15	-2N		CN		1, 0	1
7894.849	0		Atm			
7895.13	-2		CN		1, 0	
7895.515	3	3	Atm			
			(Ti p)	0.82	2.39	
			(CN)		1, 0	
7896.035	5		Atm			
7896.378	-1	ob	MgII	9.96	11.52	
7896.66	-3		⊙			1
7897.06	-3		CN		1, 0	1
7898.03	-3		⊙			1
7898.38	-3		Si?p	6.07	7.63	1
			CN		1, 0	
7899.53	-2		Atm			1
7899.86	-2		CN		1, 0	1
7900.797	3		Atm			
			(CN)		1, 0	
7901.16	-3		Atm			1
7901.780	9		Atm			
			(CN)		1, 0	
7902.880	-1		Atm			
7903.160	0	1	⊙			
7903.794	-1		Atm			
7904.18	-3		Fe p	2.98	4.54	1
7904.53	-3	-3	⊙			1,24
7905.60	-3	-3	CN		1, 0	1,24
7906.33	-3		Atm?			1
7906.80	-3		⊙			1
7907.19	-2		Atm			
7907.46	-2		Atm			1
7908.14	-3N		Cr	5.60	7.16	1
7908.750	8		Atm			
			(CN)		1, 0	
7909.05	-3					1
7909.370	1N	2N	Atm			
			Ti p	3.31	4.87	
7909.610	-2		CN		1, 0	
			Fe?p	4.99	6.55	
7910.664	2		Atm			
			(Cr)	5.60	7.16	
7911.31	-3		Atm			1
7912.004	-2	0	⊙			
7912.384	-1	-2	Si	6.07	7.63	
7912.870S	2	5	Fe	0.86	2.41	
7913.438	-1	-2	Si	5.84	7.40	
7913.80	-3	-1	CN		1, 0	1
7915.35	-3		⊙			

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
7915.634S	3		Atm			
7916.10)	-3		Atm			1
7916.32	-3		⊙?			1
7916.532	-1		Atm			
7916.79	-2		⊙?			1
7917.428)	2	3	Ni	3.72	5.28	
7917.561	0		Atm			
7917.78	-3		Cr	5.60	7.16	
			CN		1, 0	
7918.383	4	1	Si	5.93	7.49	
			(CN)		1, 0	
7920.03	-3		CN		1, 0	1
7920.24	-3		CN		1, 0	1
7920.666S	7		Atm			
7922.98	-2NN	ONN	-CN		1, 0	1
7923.81	-3N	ob?	S?	8.38	9.94	
7924.169	-1	ob?	Fe p	4.77	6.33	
7924.348	4		Atm			
7925.30	-3d?		Atm?			1
7925.82	-1	ob				
7926.29	-3	-1	Ti	3.27	4.83	1
			CN		1, 0	
7926.54	-3		⊙			1
7927.14	-3N		⊙			1
7927.928	-2		CN		1, 0	
7928.24	-2		Atm			1,40
7928.618S	7		Atm			
7929.20	-3		Atm?			1
7929.339	2		Atm			
7929.68	-3		Atm?			1
7929.81	-3		CN		1, 0	1
7929.939	-1		Atm			
7930.28	-3N		GdII?-			
			S?	8.38	9.94	1
7930.819	2N	2N	Mg p	5.92	7.48	
7931.772	2		Atm			
			(S)	8.38	9.94	
7932.351	8N	5N	Si	5.94	7.49	
7933.12	1	2?	Cu	3.77	5.33	
			(CN)		1, 0	
7933.48	-2	-1	CN		1, 0	1
7934.11	-3N		⊙?			1
7934.99	-3N		⊙			1
7936.39	-3N		⊙			1
7937.150S	7	7	Fe	4.29	5.85	
7937.65	-3		CN		1, 0	1,40
7938.05	-3		⊙			1
7938.61	-2	-1	Ti p	1.87	3.43	1
			CN		1, 0	
7938.96	-2		Atm			
7939.23	-2		CN		1, 0	1
7941.096S	2	3	Fe	3.26	4.81	
7941.79	1N		Atm-			
			Fe p	3.03	4.59	
7942.00	-2	-1	Cr	4.37	5.93	
			CN		1, 0	
7942.74	-1		Atm			
7943.28	-2	-2?	⊙			

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
7944.001	8N	6N	Si	5.96	7.51	
			(Ti)	3.28	4.83	
7944.38	-3		CN		1, 0	1
7945.27	-3		⊙			1
7945.858S	7	9	Fe	4.37	5.92	
7946.744	0		Atm			
			(CN)		1, 0	
7947.63		2	Rb	0.00	1.55	
7947.726	2		Atm			
7948.78	-2	-2	CN		1, 0	1
7949.149	-2	4	Ti	1.50	3.05	
7950.42	-3	-2	CN		1, 0	1
7950.889	1		Atm			
7951.176	1		Atm			
7951.73	-2	-1	CN		1, 0	1
7953.07)	-3N		Atm?			1
			Ni?	4.52	6.07	
7953.39)	-3		⊙?			1
7953.64	-2		Atm?			1
7953.84	ins		⊙?			
7954.12	-3		⊙?			1
7954.57	-2)	0N	CN		1, 0	1
7954.97	-1N		Fe p	2.98	4.53	
7955.71	1	-1	Fe	5.01	6.56	
7956.19	1		Atm			
7956.71	-1	0	Zr	0.65	2.20	
			CN		1, 0	
7957.01	-2	-1	CN		1, 0	
7957.77	-3		Atm			
7958.21	-3		CN		1, 0	1
7958.492S	7		Atm			
7958.76	-3					1
7959.148	1	0	Fe	5.01	6.56	
7959.70	-3		⊙			1
7960.270	1		Atm			
7960.734	5		Atm			
7961.604	3	5	Atm			
			Ti	3.29	4.84	
7962.606	-2		CN		1, 0	
7962.861	-3d		Atm			
7963.132	8N		Atm ⊙?			22
			(CN)		1, 0	
7964.349	2		Atm			
7964.970	3	2d	Atm			
			Fe p	5.04	6.59	
			(CN)		1, 0	
7965.55	-2	-1N	Fe p	5.06	6.61	1
7966.43	-2		Atm			
7967.10	-2	-1	CN		1, 0	
			Fe?p	4.17	5.72	
7967.70	-3		Atm?			1
7968.121	4		Atm			
7968.473	-1		CN		1, 0	
7968.765	-1		Atm			
7969.26	-3N		Atm?			1
7970.11	-1)	0N	CN		1, 0	1
7970.300)	2N		Si	5.94	7.49	
7970.81	-3		⊙			1

I A	Intensity Disk	Spot	Ident	E P	or Band Data	Notes
7971.522S	4		Atm			
7971.86	-3		Atm ⊙			1
7972.15	-2	ob?	⊙			
7973.79	-3		CN		1, 0	1
7974.136	0		Atm			
7974.69	-2		CN		1, 0	
7975.002	0		Atm			
7975.58	-2N		⊙			
7976.30	-2		⊙?			1
7976.586	-1		Atm			
7977.215	-2		CN		1, 0	40
7977.995	-1		Atm			
7978.56	-3		CN?		1, 0	1
7978.834	0	8	Ti	1.88	3.43	
				3.31	4.85	
7979.81	-3N		CN		1, 0	1
7980.008	0	0	Atm			
			Fe?p	5.06	6.61	
7980.452	0		Atm			
7980.79	-3		⊙			1
7981.150	-3	-2	CN		1, 0	
7981.54	-3		⊙?			1
7981.84	-3		Atm			1
7982.87	-3		Atm			1
7983.65	-3		Atm			1
7984.00	-3		Atm			1
7984.342S	4		Atm			
7984.615	-3		CN		1, 0	
7985.17	-3		⊙?			
7985.75	-3N		Atm?			1
7986.264	2		Atm			
7986.53	-3		⊙?			1
7987.24)	-1N	ON	⊙			1
7987.391	-1	0	Atm			
			Co	2.07	3.62	
7987.97)	-2	-1?	CN		1, 0	1
7988.113	1		Atm			
7990.729	1		Atm			
7990.90	0		Atm?			
7991.52	-3		Atm?			1
7991.71	-2		⊙?			
7992.322	-1	0	CN		1, 0	
7993.048	-2N	-2N	Al			
7993.43	-3		⊙?			
7993.86	-1	0	⊙			1
7993.969	-1	-2	⊙			
7994.488S	3	3	Fe			
7995.019	-1	0	Si p	5.59	7.14	
			CN		1, 0	
7995.63)	-1)	ON	CN		1, 0	
7995.809	-2		⊙			
7996.485	-1	3	Ti	3.32	4.87	
7996.80	-3		Co?	2.13	3.67	1
7997.572	-2		Atm			
7998.247	2		Atm			
7998.499	2		Atm			
7998.953	8	8	Fe	4.35	5.90	
7999.88	-3		CN		1, 0	1
8000.300S	6		Atm			
			(CN)		1, 0	
8000.52	-3		Atm?			1
8000.959	-2		Atm			
8001.40	-3		Atm?			
8002.40	-2		CN		1, 0	1
8002.56	-2		Fe p	4.56	6.10	
8003.237	0		Atm			
8003.53	-2		Atm?			
8003.93	-2N		⊙?			
8004.588	0		Atm			
8004.971	0		Atm			
8006.46	-3		⊙?			1
8006.62	-2		Atm?			1
8006.97)	-3		⊙?			1
8007.470	9		Atm			
			(CN)		1, 0	
8007.720	3		Atm			
8008.455	-1		CN		1, 0	
8009.38	-3N		Si p	6.10	7.64	
8010.088	-1		CN		1, 0	
8010.896	1		Atm?			
8011.24	-3		Atm?			1
8011.72	-3		⊙			1
8011.98	-3		⊙?			1
8012.273)	-1	ob?	⊙			
8012.484	-1	-2	⊙			
8012.940S	4		Atm			
8013.384	0		Atm			
8013.81	-3		Atm			1
8014.051	1		Atm			
8014.713	-1		Atm			
8015.652	-2		Atm?			
8016.523	-1		Atm			
			Fe p	4.77	6.31	
8017.04	-3		CN		1, 0	
8017.425	0		Atm			
8018.044	-1		Atm			
			Cr	4.37	5.91	
			(CN)		1, 0	
8018.304	-1		Atm			
8020.240	-2	-1	⊙			
8020.709	3		Atm ⊙			
8021.44	-3		⊙?			
8022.055	1		Atm			
8022.52	-2	-2	⊙?			
8022.971	0		Atm			
8023.166	2		Atm			
8023.852	1		Atm			
8024.178	1		Atm			
			(CN)		1, 0	
8024.547	-1	ob	Fe			
8024.861	-1	5	Ti	1.87	3.41	
8025.193	0		Atm			
8025.57	-3					1
8025.865	-1		Atm?			
			CN		1, 0	
8026.09	-1		Atm			

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
8026.38	-2		CN		1, 0	
8026.925	1	-1	⊙			
8027.39	-3	0N	V	1.06	2.60	
8027.838	1	-2	⊙			
8027.93	-1	-2	Fe p	3.24	4.77	
8028.318	5	4	Fe	4.45	5.99	
8028.544	4		Atm			
8029.453	-1		Atm			
8030.36	-2		⊙?			
8030.67	-2		⊙?			40
8031.269	1		Atm			
8032.04	-2		Atm?			
8032.77	-2		CN		1, 0	1
8033.606	2d		Atm			
8034.293	3		Atm			
8034.60	-3		Ni	3.72	5.26	1
8034.962	-1	0	Ti			
			CN		1, 0	
8035.36	0		Atm			
8035.608	0N	-2N	Si	5.96	7.49	
8036.460S	3		Atm			
8037.878	-1		Atm			
8038.15	-1		Atm?			
8039.600S	3		Atm			
8040.00	-3		⊙?			1
8040.28	-3		CN		1, 0	1
8041.038	-1		Atm			
8041.77	-2N	-1N	CN		1, 0	1
8042.321	0	0	⊙			
8043.169	3		Atm			
8043.612	-1		Atm			
8043.874	-1		CN		1, 0	
8044.398	2		Atm			
			(CN)		1, 0	
8045.530S	3		Atm			
8046.058S	8	8	Fe	4.40	5.93	
8046.49	-3					1
8046.80	-3		Si p	6.10	7.63	
8047.625S	4	8	Fe	0.86	2.39	
8048.980	-1		Atm			
8049.33	-2N	-3NN	⊙			
8049.90	-1NN		-CN		1, 0	
8051.12	-3		⊙			
8052.435	2		Atm			
8052.88	-3		⊙?			1
8053.098	1	2	-CN		1, 0	
8053.81	-3		⊙?			1
8054.311	5N	6N	⊙			
			(CN)		1, 0	
8054.903	-1		Atm			
8055.995	-1	0?	Co?	4.13	5.66	
8056.36	-3		⊙?			1
8056.67	-3		⊙?			1
8056.95	-3		⊙?			1
8057.27	-3	-1	⊙			1
8057.91	-3		⊙?			1
8058.54	0N		Atm			
8058.74	-1	ob?	⊙			
8059.538	1		Atm			
8060.249	0		Atm			
			CN		1, 0	
8060.70	-3		⊙?			1
8061.16		-1	Cr?	4.39	5.92	1
8062.161	0d					
8062.594	-2	-1	CN		1, 0	
8062.89	-3		Ti?p	2.14	3.67	1
8063.10		-1	Zr	0.62	2.15	
8063.286S	2		Atm			
8064.106	-2		CN		1, 0	
8064.61	-3		Atm?			
8065.226	1		Atm			
8065.876	-1N		⊙			
8066.07		-1	Ti	1.88	3.41	1
8067.26	-3		CN		2, 1	1,40
8067.78	-3		⊙?			1
8068.261	-2	4	Ti	1.87	3.39	
8068.50	-2	ob	SaII	1.74	3.27	
8069.34	-3		⊙?			1
8069.79	-2		⊙?			1
8070.016	-1	ob?	⊙ Atm			
8070.34	-1	2	Zr-	0.73	2.26	
8070.620	-1		Si?p	6.07	7.60	
			CN		1, 0	
8071.262	1N	ob	⊙			
8072.162	-1	1	Fe	2.41	3.94	
8072.381	-1		Atm?			
			CN		1, 0	
8073.029	-1	-2N	⊙			
8073.80	-3		⊙?			
8074.430	-2		CN		1, 0	
8074.744	-2		⊙			
8075.158S	2	6	Fe	0.91	2.44	
8075.549	0N	ob	⊙			
8076.293	1		Atm			
8077.012	-2		⊙?			
8077.68	-3		⊙?			1
8077.96	-3		⊙?			1
8078.501	1	0	Atm ⊙			
8079.252	0		Atm			
8079.597	0		Atm			
8080.582	-2	4N	Ti p	2.17	3.69	
8080.69	1N		Fe	3.29	4.81	
			Atm			
8081.11	-3		⊙?			1
8081.523	0	1N	CN		1, 0	
			Atm			
8082.16	-2					
8082.54	-2		CN		1, 0	
8082.969	-1	0	⊙ Atm			
8083.19	-3N					1
8083.82	-3N					1
8084.807	-1		Atm			
8085.175	8	7	Fe	4.43	5.95	
			(CN)		1, 0	
8085.431	1		Atm			40
8085.82	-3		⊙?			1
8086.18	-3		Si?p	6.06	7.58	
8087.46	-2N		⊙?			1

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	Data	Notes
8088.31	-3		⊙?			1
8088.56	-2		Atm?			
8089.361	-1	-2?	⊙			
8089.76	-3N		⊙?			1
8090.464	1N	-1N	⊙ Atm?			9
8091.082	-1		Atm			
8091.50	-3		⊙?			1
8091.95	-2N		⊙?			
8092.640	2	1	Cu	3.80	5.33	
			(CN)		1, 0	
8093.04	-3		CN		1, 0	
8093.232	3	0N	Si	5.84	7.36	
			V?	1.05	2.57	
8093.76	-3					1
8093.937	1	-1	Co	4.00	5.53	
8094.270	2		Atm			
8094.836	-2		⊙?			
8095.352	-1		Atm			
8096.02	-1	-1	Ni?	5.61	7.13	
			CN		1, 0	
8096.580s	3		Atm			
8096.874	1	1	Fe	4.06	5.58	
8097.524	0N		⊙			
8098.746	7N	5N	Mg	5.92	7.44	
			Atm			
8098.90	-2					
8099.418	-1		Atm			
8100.43	-3					1
8101.09	-2					
8101.382	0		Atm			
8101.86	-2		Atm?			1
8102.285	-1		⊙?			
8103.165s	1		Atm			
8103.764	-2		⊙?			
8104.03	-2Nd?		⊙?			1
8104.709	0		Atm			
8105.69	-3					1
8105.937	-2					
8106.385	-1		Atm			
8106.708	-2					
8107.12	-2		CN		1, 0	1
8107.32	-2		⊙			1
8107.842s	4		Atm			
8108.312	-2		Fe p	2.72	4.24	
8109.018	2		Atm			
8109.840	-1		-CN		1, 0	
8110.090	-2		CN		1, 0	
8110.568	2		Atm			
8111.01	-3		Atm?			1
8111.85	-3		⊙?			1
8112.179	-2		Fe p	2.68	4.20	
8112.406	2		Atm			
8113.631	3		Atm			
8113.948	4		Atm			
8114.69	-1	-3	⊙			
8114.890	0	0	CN		1, 0	
8115.931	-2	-1	⊙			
8116.73	-2N	10N	-V	1.08	2.60	
8117.301	-2	-2?	⊙?			

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	Data	Notes
8118.105	1		Atm			
8118.446	-1		Atm			
8118.910s	2		Atm			
			(CN)		1, 0	
8119.70	-3	-2	⊙			
8119.992	-2		Atm ⊙			
8120.661	2		Atm			
8121.248	0		Atm			
8121.499	1		Atm			
8122.22	-3		⊙			1
8122.576	3		Atm			
8122.820	-1		Atm			
8123.316	1		Atm			
8123.579	1		Atm			
8124.289	-3N	-3N	Atm?			
8125.054	2N	3N	⊙ Atm			
8125.445s	3		Atm			
8126.227	-2	-1	CN		1, 0	
8126.48	-3					1,61
8126.852	3		Atm			
8127.130	-2		Atm			
8127.94	-3N	-2N	Ti?			1
8129.35	-3		Fe p	2.75	4.26	
8130.01	2		Atm			
8130.23	-1		Atm			
8130.460	5		Atm			
			(CN)		1, 0	
8131.00	-1		Atm?			1
8131.213	2		Atm			
8131.38	-1		⊙?			1
8131.709	-2		Atm?			
8132.373	0N		Atm ⊙			
8133.04		-1	Zr	0.68	2.20	
8133.209s	2		Atm			
8133.564	-1		Atm			
8133.777	10		Atm			
8134.520	-1		Atm			
8135.047	9		Atm			
8136.207	1		Atm			
8136.525	3		Atm			
8137.149	1		Atm			
8137.47	-3	-2	⊙			1
8137.974	-2	-1	⊙			
8138.777	1		Atm			
8139.718s	3		Atm			
8140.674	10d		Atm			
8141.936	9		Atm			
8142.761	-2		⊙			
8143.56	-3		Atm			
8143.794	4		Atm			
8144.193	1		Atm			
8144.515	1	3N	Atm			
			V	1.04	2.55	
8144.76	-3		Atm?			1
8145.478	-1	0	Fe			
8146.213s	5		Atm			
8146.67	-3		Fe p	3.26	4.77	
8147.188s	5		Atm			
8148.078	3		Atm			

I A	Intensity Disk	Spot	Ident	E P or Band Data		Notes
8148.392	6		Atm			
8149.269	3		Atm			
8149.689	5ns		Atm			
			Fe	4.56	6.08	
				4.56	6.08	
8149.876	4		Atm			
			(CN)		1, 0	
8150.54	-3		Si p	5.59	7.10	
8151.336	-2		⊙?			
8151.95	-3		Co	4.05	5.57	1
8152.498	8		Atm			
8153.06	-2		⊙			
8153.703	5		Atm			
8154.409	3		Atm			
8154.670	9tr		Atm			
8155.22	-3		⊙ Atm			40
8155.467	-1		Atm ⊙?			
8155.85	-3		Atm?			1
8156.51	-3		Atm?			
8156.854	-1		Atm			
8157.57	-3		⊙?			1
8158.019	9		Atm			
			(CN)		1, 0	
8158.84	-3		⊙			
8159.15	-1	ON	⊙			1,40
8160.16	-3N		⊙			
8160.78	-3		⊙			
8160.98		1N	V	1.06	2.57	
8161.434	9		Atm			
			(CN)		1, 0	
8161.972	5		Atm			
8162.35	9		Atm			
8162.801	-3		Atm			
8163.02	-3	-1N	Atm			
			Cr?	4.37	5.88	1
8163.776	-1		Atm			
8164.157	2		Atm			
8164.54	(20)		Atm			
8165.337S	3		Atm			
8165.79	-3		⊙?			1
8166.06	-3		⊙?			1
8166.450	-1		Atm			
8166.75	-3		Cr?	4.39	5.90	
				4.37	5.88	
8167.138	-1		Atm			
8167.660	-2		⊙			
8168.107	-2		⊙			
8168.820	8		Atm			
8169.386S	6		Atm			
8169.995	10		Atm			
8171.239	0	-1	Fe p	5.00	6.51	
8171.647	-1		Atm			
8172.00	-3		⊙?			1
8172.36	-3		⊙			
8173.008	2		Atm			
8173.36	-3		⊙?			
8173.754	0		Atm			
8174.12	-3		⊙			
8174.678	3		Atm			

I A	Intensity Disk	Spot	Ident	E P or Band Data		Notes
8175.12	-3		⊙?			
8175.72	-3		Atm?			
8176.32	-3					1
8176.975	(20)		Atm			
8177.932S	7		Atm			
8178.491S	4		Atm			
8179.056	7		Atm			
			(Fe)	4.29	5.80	
8179.48	-3		Si p	5.84	7.35	1
8179.913	0		Atm			
8180.23	-3		⊙?			1
8180.878	-3		⊙			
8181.273	-3		⊙			
8181.848S	9		Atm			
8182.25	-3		Atm?			
8182.48	-3		⊙			
8183.12	1		Atm			
8183.30	11N	15N	Na	2.09	3.60	15
8184.207	-2		⊙ Atm?			
8184.50	-3		⊙			
8184.78	-2		Atm			
			N?	10.29	11.79	
8185.34	-3		⊙?			
8185.67	-3		Cr?	4.39	5.90	
8186.371	8		Atm			
8186.791	2	3	Fe	4.89	6.40	
			(V)	1.05	2.55	
8187.852	1N	0	Atm			
			N	10.28	11.79	
8188.11	-2N	-1N	⊙			
8189.272	(20)		Atm			
8190.83	-2		⊙			
8191.02	-1		Atm			
8191.61	-3N		Atm?			1
8192.069	-1		Atm			
8192.24	-2					
8192.55	-3					
8193.113	(20)		Atm			
8193.738	-2		Atm			
8194.233	-3		Atm			
8194.836S	12N	18N	Na	2.10	3.60	15
8195.452	-2		⊙			
8195.98	-3		Atm			
8196.51	-2		Fe p	4.57	6.08	
8196.96	-3		⊙			
8197.704	(20)		Atm			
8198.278	-3		⊙			
8198.98	3	6	Fe	4.42	5.92	
			Atm			
			V	1.04	2.54	
8199.49	-3		Atm			
8199.989	4		Atm			
8200.694S	6		Atm			
8200.99	-3		⊙			
8201.20	-3		⊙			
8201.57	-2		Atm			
8201.695	2	0	Atm ⊙			
8202.14	-3		Fe?			
8202.37	-3		Atm			

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	E P Data	Notes
8202.94	-3		⊙			
8203.230	-2	ob?				
8203.53	-3		⊙?			1
8204.09	-2	1	Fe p	0.91	2.41	
8204.827	3	5	Atm			
8204.95	ON		Fe p	0.95	2.46	
8205.31	-3					
8205.67	-3		⊙?			
8206.785	-1		Atm			
8207.04	-3		⊙			1
8207.749S	4	5	Fe	4.43	5.93	
8208.15	-3		Atm			
8208.56	-2		Co	4.22	5.73	
8209.559	3		Atm			
8209.85	-3		⊙?			
8210.321	2		Atm			
8211.05	-3NN		⊙			
8211.151	-2N		Atm			
8211.57	-3	ON				
8212.132S	5		Atm			
8212.55	-3	O	Zr	0.65	2.15	
8213.041	9N	8N	Mg	5.73	7.23	
8213.85	-1d	ON	Atm ⊙			
8214.413	2		Atm			
8214.71	-3	ob?	⊙?			1
8215.155	2N	ON	⊙			
8215.798	-2	ob				
8216.303	-2	ob	N	10.29	11.79	
8216.975	-2		Atm			
8218.114S	10		Atm			
8218.51	-2	ob	⊙			
8219.710	-2		⊙			
8220.388	10	11	Fe	4.30	5.80	
8221.553S	6		Atm			
8222.24	-3		Atm?			
8222.70	-3		⊙			1
8222.88	-2	ob	N	10.29	11.79	
			Atm?			
8223.990	8		Atm			
8224.460	2		Atm			
8224.82	-3		⊙?			
8225.124	-2		⊙?			
8225.688S	5		Atm			
8226.962	(20)		Atm			
8227.25	-2					
8227.986	7		Atm			
8228.32	8d		Atm			
8228.761	8		Atm			
8228.86	-3					
8229.27	-3					
8229.762S	8		Atm			
8230.486	2		Atm			
8230.63	-3		Si	5.59	7.09	
8231.289	9		Atm			
8231.703	8		Atm			
8232.319	5	6	Fe	4.40	5.90	
8233.906S	8		Atm			
8234.628S	3		Atm			
8235.34	-3		⊙?			1
8235.81	-3		Cr?	4.38	5.88	1
8236.121	2		Atm			
8237.341S	5		Atm			
8238.538	-1	ob?	Atm			
			MgII?	9.96	11.45	
8239.132S	2	3	Fe	2.41	3.91	
8239.924S	4		Atm			
8240.379	-3		⊙?			
8241.277	-2		Atm			
8241.60		1N	V	1.05	2.54	1
8241.765	-3	-2?	⊙?			24
8242.365	2d		Atm			
			N?	10.29	11.79	
8243.130	2		Atm			
8243.488	9		Atm			
8244.05	-2N		Atm			1
8244.75	-3N		Atm			
8245.28	-3N		Atm			
8245.84	-3N		Atm			1
8246.629	1		Atm			
8246.81	-3		⊙			
8247.307	-3		⊙			
8247.85	-3		Atm			1
8248.137S	4	3	Fe	4.35	5.85	
8248.802S	4	1	⊙			
8249.620	-3		Atm			
8250.38	-2		⊙			
8250.99	-2					
8251.636	-3		⊙			
8252.02	-3		⊙			
8252.727S	6		Atm			
8253.60		1N	V	1.08	2.57	
8253.81	-3		Fe p	4.56	6.06	
8254.32	-3		Fe	3.03	4.53	1
8254.681	1	-2	⊙			
8255.57	-3		⊙?			
8256.00		2N	V	1.06	2.55	1
8256.515	(20)		Atm			
8257.283	-3		⊙			
8257.51	-3		⊙			
8257.860	2		Atm			
8258.40	-3d		⊙			1
8258.72	-3					1
8259.692S	8		Atm			
8260.355	0		Atm			
8260.79	-2		Atm?			
8261.00	-3N		Atm			1
8261.849	-1		Cr?	2.95	4.45	
			Atm			
8262.733	-1N		Atm			
8263.445S	7		Atm			
8263.850	0	0	Fe p	4.93	6.43	
8264.276	0	ob?	Fe	5.08	6.58	
8264.642	-1		Atm			
8264.969	0		Atm			
8265.69	-3N		⊙?			
8266.433	-1	0	⊙			
8267.118	-1	-1	⊙			
8268.073	-1		⊙			

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	E P Data	Notes
8268.47	-3		Atm			1
8268.83	-3		Atm ⊙			1
8269.186	2d		Atm ⊙			
8269.644	0	-2	Fe p	4.57	6.07	
8270.16	-3		⊙			1
8272.042S	8		Atm			
8272.47	-3		CN?		3, 2	40
8273.076	2		Atm			
8273.475	-2	-1	Ag?	3.76	5.25	
8274.354	(20)		Atm			
			(Fe)	5.05	6.54	
8275.553	-2		Atm			
8275.899	1	-1	Fe	4.93	6.43	
8276.54	5		Atm			
8276.69	6		Atm			
8278.19	-3		Atm			
8278.710	2	-1N	Atm ⊙			
8279.600S	9		Atm			
8282.024	12		Atm			
8282.67	-3		Atm?			
8283.06	-3		Atm?			
8283.42	-3		Atm?			
8284.53	-2d		⊙ Atm			
8285.17	-1d?		⊙ Atm			
8285.71	-3		Atm?			
8286.17	-3		Atm			
8287.233	-2		Atm			40
8287.50	-2		Atm			
8287.940	12		Atm			
8288.221	2		Atm			
8288.63	-3					
8288.955	-3	-2	⊙			
8289.535	9		Atm			
8290.01	-3		⊙			
8290.45	-3N					
8290.98	-3		⊙			1
8291.229	0		Atm			
8292.07	-3		Atm?			
8292.806	0	-2	⊙			
8293.52	4	5	Fe	3.29	4.77	
8294.160	10		Atm			
8294.541	5		Atm			
8295.299	3		Atm			
8295.668	-2		Atm			
8296.028	1		Atm			
8296.562	-3		Atm			
8297.37	-3		⊙			
8297.65	-3		Cr?	4.39	5.88	
8298.066	-1		Atm			
8298.454	-2N		⊙			
8298.973	-2N		Atm			
8299.45	-3		Atm			
8299.985	-1		Fe p	5.05	6.53	
8300.408S	10		Atm			
8300.94	-3		Atm			
8301.49	-1	ob	⊙			
8302.19	-3		⊙			1
8302.681	-3		⊙			
8303.17	-3		Fe p	2.72	4.20	
			Cr?	2.70	4.18	
8303.39	-2		Atm			
8304.300S	6		Atm			
8305.092	12		Atm			
8305.617	-1	ob	⊙			
8306.20	-3	-2	Atm?			1
			Zr?	0.62	2.11	
8306.41	-3		⊙?Atm?			1
8306.699	-2		Atm			
8307.12	-3		Atm?			1,61
8307.54		2	Ti	0.82	2.31	
8307.603	0		Atm			
			Fe p	0.99	2.47	
8308.670	0		Atm			
8309.39	-3		⊙?			
8309.71	-2		⊙			
8310.115	2	1d	Atm			
8310.252	2		⊙			
8310.829	-1		Atm			
8311.28	-3N		⊙			
8311.767	2	1	Atm ⊙			
8311.956S	6		Atm			
8312.44	-3					
8312.874	-3					
8313.301	-3		⊙			
8313.873	3		Atm			
8314.45	-3	ob?	⊙			24
8314.77	-3		⊙			
8315.67	-3		Atm			
8315.927	-1		Atm			
8316.224S	5		Atm			
8316.3	0?					1,61
8317.02	-3					
8317.394	-3		Si?	5.59	7.07	
8318.139	9		Atm			
8319.36	-3		⊙			
8320.183	-3		⊙			
8320.443	-3		⊙?			
8320.9	-1?					1,61
8321.242	9		Atm			
8321.587	10		Atm			
8322.527	-3					
8322.934	-3		⊙?			
8323.42	-3N		Atm			
8324.142	-2		⊙			
8324.608	-2		Atm			
8324.99	-3		⊙?			
8325.450	-3		⊙			
8325.737	-3		⊙			
8326.316	1		Atm			
8326.68	-3					1
8327.061S	10	12	Fe	2.19	3.67	
8328.474	1		Atm			
8328.950	-2	ob?				
8329.254	-2		Atm			
8329.682S	8		Atm			
8330.26	-2		⊙			1

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	Data	Notes
8330.489	-1		Atm			
8331.20	-3		⊙			
8331.432	-3	-3?	⊙			
8331.926	6	7	Fe	4.37	5.85	
8332.145	2		Atm			
8332.726	1		Atm			
8332.88	-1	-2N	⊙			
8333.584S	5		Atm			
8333.891	-3		Atm			
8334.33		4	Ti	0.81	2.30	
8334.454	2		Atm			
8335.150	3N	ob	C	7.65	9.13	
8335.508	3		Atm			
8336.108	0		Atm			
8336.236	0	-1	⊙			
8336.98	-2		⊙?			1
8337.10	-2		⊙?			1
8337.34	-3N		⊙?			
8337.916	-3		⊙?			
8338.343	-2		Si	5.84	7.32	
8338.666	-1		Atm			
8338.902	0		Atm			
8339.034	10		Atm			
8339.413	4	3	Fe	4.42	5.90	
8340.500	-1	-2?	⊙			
8341.443	0		Atm			
8341.874	-1		Atm			
8342.290S	3		Atm			
			(Fe p)	2.94	4.42	
8342.866	0	-2	Fe	4.97	6.45	
8343.33	-3		⊙?			
8343.716	-2	ob	⊙			
8343.932	0		Atm			
8344.31	-3		Atm			
8344.765	-3		⊙?			
8345.19	-3		Fe p	2.68	4.16	
8345.73	-3		⊙			
8346.131	9N	7N?	Mg	5.92	7.40	
8346.39	-2N		Atm			
8347.326	1	2	⊙ Atm			
8347.829	-2	-3	⊙			
8348.304	0	3	Cr	2.70	4.17	
8348.72	-3		Atm			1
8349.02		3	Fe p	0.91	2.39	1
8349.162S	4		Atm			
8349.383	3		Atm			
8349.77	-3		Atm			
8349.964	-2		Atm			
8350.733	-2	-3	⊙			
8351.04	-3		Atm			
8351.45	-3N		Atm			1
8352.18	-3		Atm			
8352.43	-3					
8352.806	-2		Atm			
8353.123	-2	3	Ti	0.81	2.29	
8353.55	-2		Atm			1
8353.642	4		Atm			
8354.36	-2N		⊙?			40
8354.723	2		Atm			
8355.15	-3		Fe p	4.09	5.56	1
8355.36	-3		⊙?			
8356.02	-3		Fe p	4.28	5.75	1
8356.37	-3		⊙?			
8357.040S	6		Atm			
8357.441	3		Atm			
8357.873	-3NN	ob?	⊙			
8358.504	1N	1N	Fe p	2.98	4.45	
8359.542	2		Atm			
8360.795	2	2	Fe	4.45	5.93	
8362.000	4		Atm			
8362.302S	5		Atm			
8362.56	-3N					
8363.254	-3		Atm			
8363.58		0	Ti p	2.08	3.56	1
8363.837	-3		⊙			
8364.243	1	6	Ti	0.83	2.31	
8364.948	-3N		⊙?			
8365.640	3	3	Fe	3.24	4.71	
8366.022	-3		Atm			
8366.542	1		Atm			
8367.022	-3		Atm			
8367.331S	6		Atm			
8369.06	-3		Atm			
8369.25	-3N		Atm			40
8369.77	-1	0N	Atm			
8369.858	-1		Fe p	4.89	6.37	
8370.472	-1		Atm			
8370.802	-2		Atm			
8371.457	-2N		⊙ Atm			
8372.177	-2		Atm?			
8372.777	-2		Co	4.05	5.53	
8373.236	-2		Atm			
8373.711	5d		Atm			
8374.546	1		Atm			
8375.713	-1		Atm			
8376.187	-2		Atm			
8376.381S	4		Atm			
8376.594	-2		Atm			
8376.90	-3					1
8377.160	2		Atm			
8377.39	-2	ob	⊙			1
8377.870	1	8	Ti	0.82	2.30	
8378.25	0N		⊙			1
8379.37	-3		Co?	4.19	5.66	
8379.77	-3		Atm?			1
8380.68	-3		Mn?			1
8381.440	1		Atm			
8382.217	-3		Fe p	0.99	2.46	
8382.541	1	5	Ti	0.81	2.29	
8382.781	1	5	Ti	0.81	2.28	
8383.302	-2	ob	⊙			
8383.58	-3N					
8383.861	-1		Atm			
8384.170	1		Atm			
8384.831	-1N		⊙ Atm			
8385.48	0N	0	⊙?Atm			
8385.63	-1		Atm			
8386.182	-1		Atm			

I A	Intensity Disk	Intensity Spot	Ident	E P or Band Data		Notes
8386.35		-1	Ti p	2.09	3.57	1
8386.53	-3		⊙?			
8386.933	0		Atm			
8387.782	10	12	Fe	2.17	3.64	
8388.328	-3					
8389.19	-3N		⊙?			
8389.521	-1	2	Ti	2.08	3.55	
			Zr	0.60	2.07	
8390.459	-2	ob	⊙			
8391.185	-2	ob	⊙			
8393.68	-2		Atm			
8394.020S	3		Atm			
8394.518	-2		Atm			
8394.882	-1		Atm			
8395.134	-1		Fe?			9
8396.900	0	4	Ti	0.81	2.28	
8397.152S	2		Atm			
8397.635	0		Atm			
8397.99	-3N		Si?p	5.59	7.06	1
8398.481	-3		⊙			
8399.12	-3					
8399.947	1N		Atm ⊙?			
8400.640	1		Atm			
8401.401	1	2	Fe	2.47	3.94	
8401.695	-2		Fe p	4.43	5.90	
8402.629	-2	-1	Ti-	2.24	3.71	
8403.001	-2		Atm			
8404.182	0		Atm			
8404.382	0	ON	⊙			
8404.73	-3					1
8405.374	3		Atm			
8405.665	0		Atm			
8407.257	-3		⊙?			40
8408.229	-1		Atm			
8408.550	-1		Atm			
8408.755	3		Atm			
8409.585	1		Atm			
8410.43	-3Nd		⊙			1
8411.127	-1		Atm			
8411.36	-2		⊙			40
8411.62	-3NN	-2NN	⊙			
8411.93	-3		Atm			1
8412.356	2	7	Ti	0.81	2.28	
8413.33	-3		Atm			
8414.084	0	Od	Zr	0.68	2.15	
			Fe p-	4.45	5.92	
			Atm			
8414.59	-3		Atm			
8415.450	4		Atm			
8416.934	-2N	4	Ti	2.23	3.69	
8417.222	0	-2	Ni	3.82	5.28	
			Atm			
8417.51		ON	Ti	2.11	3.57	1
8417.96	-3		Si p	5.59	7.06	1
8418.408	2		Atm			
8418.639	2		Atm			
8419.292	0	-1N	⊙			
8419.59	-3					1
8419.872	-1		⊙			
8420.496	-2Nd?	-2d	⊙			
8421.443	Od?	-1d?	⊙			
8422.06	-3		⊙?			
8422.412	-3		⊙?			
8422.923	1	1	Fe	4.12	5.59	
8423.14	-2NN	1?	Ti-	1.87	3.34	
8423.65	-3		Atm?			1
8424.139	2	ob	Fe	4.93	6.40	
8424.44	-2N	2	Ti	2.09	3.56	1
8425.62	-3		⊙?			1
8425.889	-3		Fe p	1.01	2.47	
8426.126	-3		⊙			
8426.514S	2	8	Ti	0.82	2.29	
8426.997	-2NN		⊙			
8427.40	-2		Atm			1
8427.769	-3		Atm			
8428.107	-3		Atm?			
8429.595	-1		Atm			
8429.967	-2		⊙			
8430.798	2		Atm			
8431.236	-3					
8432.389	-2		Atm?			
8433.23	-3					
8434.10	-3					1
8434.509	Od	-2	Fe p	4.99	6.45	
8434.968S	4	9	Ti	0.84	2.31	
8435.28	-3		Si?p	4.91	6.37	
8435.655	3	9	Ti	0.83	2.30	
8436.376	2		Atm			
8437.232	-2		⊙?			
8437.462	-2	-2N	⊙?			

The bolometer indicates faint diffuse absorption here, superposed on the neighboring sharp lines. We interpret this as due to the fifteenth line (n = 18) in the Paschen series of hydrogen. See Note 20.

I A	Intensity Disk	Intensity Spot	Ident	E P or Band Data		Notes
8438.054	1		Atm			
8438.64	-3		⊙?			
8438.920	-2	3	Ti	2.25	3.71	
8439.581S	5	5	Fe	4.53	5.99	
8440.02	-3N					1
8440.40	-3⊙?					
8440.751	1d?		⊙?Atm			
8441.480	-3	ob	⊙			
8441.765	-3	ob	⊙			
8442.476	2		Atm			
8443.00		-1	Ti	2.24	3.70	1
8443.975	3	ob	Si	5.85	7.31	
8444.377	-3		Si	5.85	7.31	
8444.783	-1		Atm			
8445.278	-3		⊙?			
8445.729	-3		⊙?			
8446.359	5N	1	O	9.48	10.94	23
				9.48	10.94	
			(Fe p)	4.97	6.43	
8446.741	2N	ob	O	9.48	10.94	23
			(Fe p)	4.89	6.35	
8447.12	-3					1
8447.34	-3		Fe p	4.89	6.35	1
8447.678	-3	-1	Fe p	0.95	2.41	

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	Data	Notes
8448.60	-3		Atm?			
8449.43	-3		Atm?			
8450.022	-1N	-1N	⊙			
8450.247	-1N?	0	Cr	2.70	4.16	
8450.880	-1N	3	Ti	2.24	3.70	
8452.086	0		⊙			
8453.661	0	-2N	⊙			
8455.295	-3	1	Cr	2.70	4.16	
8456.01	-3		Atm?			
8456.945	0d		Atm			
8457.15		2	Ti	1.74	3.20	1
8457.88	-3					
8458.70	-3		Atm?			1
8458.99	-3N		Fe p	4.97	6.43	
8459.734	-3		⊙?			
8460.245	3		Atm			
8461.472	-3		Fe p	3.59	5.05	
8462.39	-2		⊙?			
8462.90	-3		Atm?			1
8463.539	-3N		⊙?			
8464.03	-3		Fe p	5.05	6.50	
8464.69		-1	Zr	0.65	2.11	1
8465.173	-2		Fe p	4.99	6.45	
8465.634	-3		⊙?			
8466.102	-3		Fe p	4.97	6.42	
8466.510	-3		Fe p	4.12	5.58	
8467.158	-3	3	Ti	2.11	3.57	

The bolometer shows diffuse solar absorption in this region due to the fourteenth line (n = 17) in the Paschen series of hydrogen. See Note 20.

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	Data	Notes
8467.734	-3		⊙?			
8468.02	-2					1
8468.418S	9	12	Fe	2.21	3.67	
			(Ti)	1.88	3.34	
8468.839	-3					
8469.20	-3		⊙?			
8469.892	-3		⊙?			
8470.377	-3		⊙?			
8470.949	-3		⊙?			
8471.28	-3		Atm?			1
8471.744S	2	0	Fe	4.93	6.39	
8472.399	-2		⊙			
8473.663	0	ob	Mg?p	5.91	7.36	
8474.362	-1		Atm			
8476.35	-3		Atm?			1
8476.69	-3N		Atm?			
8477.127	-2		⊙			
8477.54	-3					
8477.999	-1	ob?	⊙			
8478.456	-3					
8478.890	-3					
8479.67	-2					1
8479.864	0	-1N	⊙?			
8480.636	0	-1	Fe p	4.97	6.42	
8481.22	-3d?					1
8481.60	-3					
8481.986	1	1	Atm			
			Fe p	4.17	5.62	
8482.412	-3					

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	Data	Notes
8482.876	-3					
8483.16	-3	-1N	Ti	1.87	3.32	40
8483.447	-1					
8486.914	2		Atm			
8487.62	-3		⊙			1
8487.92	-3					
8488.306	-1		Atm			
8491.291	-3					
8491.735	1		Atm			
8492.082	-2		⊙?			
8493.39	-3					
8493.796	0	-2	Fe p	4.93	6.39	
			Atm			
8494.44		1	Ti	1.73	3.18	1
8495.73	-3					
8496.075	-3	1	Ti	2.24	3.69	9
				3.68	5.13	
8496.483	-1		Fe p	4.40	5.85	
8496.994	2	2W	Fe	4.59	6.04	
8498.062	20	(25)	CaII	1.69	3.14	50
8499.326	-1	ob	⊙			
8499.883	-1		Atm			
8500.330	-3					
8501.553	1	-1	Si	5.85	7.30	
8501.803	-2	ob?	Ni	3.83	5.28	
8502.228	3	-1	Si	5.85	7.30	

The thirteenth member (n = 16) of the Paschen series of hydrogen is masked by Ca II on bolometer curves. See Note 20.

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	Data	Notes
8502.76	-3					
8503.145	0		Atm			
8503.54	-3					1
8503.966	-3		⊙?			
8504.536	-2		⊙?			
8505.112	-2		⊙?			40
8505.852	1		Atm			
8507.70	-3		Atm			
8509.65	-1		Fe p	4.35	5.80	
8510.253	-1		⊙?			
8510.92	-3					
8511.23	-3					
8511.49	-3					1
8511.912	2		Atm			
8512.294	1		Atm			
8512.97	-3		Fe p	3.00	4.45	1
8513.26	-3					1
8513.45	-3					1
8514.082S	7	9	Fe	2.19	3.64	
8514.63	-3		Si?p	5.59	7.04	
8515.122S	5	5	Fe	3.00	4.45	
8515.63	-3					
8516.007	-1N		⊙?			
8516.75	-3					1
8517.295	0		⊙?			
8518.011	-2	2	Ti	2.13	3.57	
8518.397	0	1	Ti	1.87	3.32	
8519.10	-3		Fe p	4.93	6.38	
8519.640	2		Atm			
8520.73	-3					

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
8521.219	-2N	-1N	⊙?			
8522.01	-3					1
8522.99	-1NN	0NN	⊙			9
8523.46	-3					
8524.72	-2		⊙			1
8525.008	-1	-2	Fe p	4.56	6.01	
8525.50	-3		⊙?			1
8525.72	-2N	-1	⊙			
8526.02	-3		⊙?			1
8526.32	-2		⊙?			1
8526.676S	3	1	Fe	4.89	6.34	
8526.994	-3		Atm			
8527.847	0	-2	Fe p	5.00	6.45	
8529.68	-3	-2	⊙			
8529.90	-3	-2	⊙			
8530.17	-3	-2	⊙			
8531.51	-2	-1Nd	Ti-Atm	1.73	3.17	
8531.71	-2	-1	⊙			
8533.34	-3					
8534.781	0		Atm			
8535.50	-3N		⊙?			
8536.163	3N	0	Si	6.15	7.60	
8536.68	-3					
8538.021	3	1	Fe p	4.89	6.34	
8538.77	-3	-1	⊙			
8539.33	-3	1	Ti	2.23	3.67	
8539.888	0		⊙			
8540.817	3		Atm			
8542.144	25	(25)	CaII	1.69	3.14	50
The twelfth member (n = 15) of the Paschen series of hydrogen is masked by strong Ca II on bolometer curves. See Note 20.						
8546.222	-1		Atm			
8547.19	-3					
8547.74	-3					
8548.079	-1	3	Ti	1.87	3.31	
8548.863	-2	0N	Cr	2.70	4.14	
8549.188	-3		⊙?			
8549.74	-3N		⊙			1
8550.366	0	-1	Si p	6.20	7.64	
8550.52		-1N	Ti	1.74	3.18	
8553.762	1		Atm			
8554.271	-2					
8555.000	-2					
8555.569	-2	0	Cr	2.70	4.14	24
8556.32	-3					1
8556.797S	8N	2N	Si	5.85	7.29	
8558.563	-3					
8559.061	-2					
8559.751	-2					
8560.02	-3		Fe	5.00	6.45	1
8560.639	-3					
8561.05	-3					
8561.61	-2	ob				
8562.109	0	-1?	Fe p	4.45	5.90	
8562.365	-2					
8563.83	-3					
8564.62	-3					1

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
8565.456	-3d?	-1	Ti	1.73	3.17	
8567.043	-2	ob?	⊙?			
8567.776	-1	ob?	Fe p	4.89	6.33	
8568.724	-1		Atm			
8569.02	-3					
8569.67		-1	Ti	2.22	3.66	1
8571.08	-3					
8571.328	-3		Atm			
8571.807S	2	-1	Fe p	4.99	6.43	
8572.23	-3					1
8572.65	-3					1
8573.141	0		Atm			
8573.47	-2	-2N	⊙			
8573.96	-3					1
8574.538	-3	-2N	⊙?			
8575.268	-2		⊙?			
8575.75	-3					
8576.48	-3		Fe p	4.57	6.01	
			Si?p	6.20	7.63	
8577.19	-3					
8578.43		-2	Ti	1.73	3.16	1
8579.08	-2		Si	5.96	7.40	
8581.76	-3N					
8582.271S	6	7	Fe	2.98	4.42	
8582.857	-2					
8583.310	-1	2	⊙			
8584.09	-3					
8584.791	-2		Fe p	4.99	6.43	
8585.27	-3					1
8585.577	0	ob?	S			
8586.211	0	-1	Ni?	5.42	6.86	
8586.64	-3					1
8586.90	-3N		Atm?			1
8587.04	-3		⊙?			
8587.93	-3					
8588.34	-3N					1
8589.59	-3N		-Co?	4.13	5.57	1
8590.327	-2					
8591.191	-2					
8591.54	-2		Atm?			
8592.119	-2		Fe p	4.99	6.42	
8592.969	3N	1	Fe	4.93	6.37	
8595.07	-3N		Atm?			1
8595.968S	3N	0N	Si p	6.16	7.60	
8597.059	1N	-1N	Si	6.16	7.60	
8598.17	-3d?	1	Ti	2.26	3.69	
The bolometer shows diffuse solar absorption in this region due to the eleventh line (n = 14) in the Paschen series of hydrogen. See Note 20.						
8598.836S	3	2	Fe	4.37	5.80	
8601.03	-3	0	Ti	1.73 2.24	3.16 3.67	
8602.18	-3		⊙?			
8602.77	-3	0	Ti?p	2.48	3.91	
8603.82	-2	-2	⊙?			
8604.92	-3		⊙?			
8605.74	-3		Atm?			1,61
8606.00	-2	ob	Si	5.93	7.36	
8606.383	-2	ob?	Ni	5.26	6.70	

I A	Intensity Disk	Intensity Spot	Ident	E P or Band Data		Notes
8607.075	0	-1	Fe p	4.99	6.42	
8607.78	-3	-2	⊙			
8608.337	0	-2	⊙			
8608.98		-3				1
8610.10	-3					
8610.609	1	-1	Fe p	4.42	5.85	
8611.11		-1	⊙			1
8611.812S	7	8	Fe	2.83	4.27	
8612.90		-2N	Ti	1.73	3.16	1
8613.946S	1	-2	Fe p	4.97	6.40	
8615.314	-1	-1N	⊙			
8616.284S	2	1	Fe p	4.89	6.32	
8616.99	-3N		⊙?			
8618.41		-1N	Ti	2.23	3.66	1
8619.10	-2d?	-2N				
8619.45	-2	-2N	⊙			1
8621.618	5	6	Fe	2.94	4.37	
8622.05	-3		Atm?			1,61
8622.753	0	-1N	⊙			
8623.738	-2					
8624.46	-3		Atm?			
8626.39	-1?		⊙			1
8626.59	-1?		Atm			1
8629.16	-1N		N?	10.64	12.07	
8631.25	-3					1
8631.92	-3		⊙?			1
8632.424	0	-1	Fe p	4.09	5.52	
8633.10	-2N		⊙?			
8633.956	0	2	⊙			
8634.16	-2					1
8636.26		-3d?	Cr	2.70	4.13	24
8637.003	0	-1	Ni	3.83	5.26	
8643.00	-3	-2N	Cr	2.70	4.13	
8643.35	-3		Fe p	4.89	6.32	
8646.358	0	ob	⊙			
8647.88	-2		⊙?			1
8648.472S	10N	3	Si			
8650.91	-3		Atm?			
8652.475	-1		Fe p	4.14	5.56	
8654.04	-3		⊙?			
8654.436	-1	-2	Fe p	3.29	4.71	
8655.20	-3		⊙?			1
8656.05	-3		Atm?			1
8656.672	-1	-2	Fe p	5.00	6.42	
8657.57	-3		⊙			1
8661.97	2	4?	Fe	2.21	3.64	1
8662.170	23	23	CaII	1.69	3.11	50
8663.723	-1	ob?	Fe p	4.97	6.39	
The tenth member of the Paschen series of hydrogen (n = 13) is masked by strong Ca II on bolometer curves. See Note 20.						
8667.366	-1	-1	Si p	5.94	7.36	
			Fe?p	2.44	3.87	
8668.456	-2d?		⊙			
8670.20	-2		S	7.83	9.26	
8670.627	-1		S	7.83	9.26	
8671.308	-1N		S	7.83	9.26	
8671.879	0	-1	Fe p	5.00	6.42	
8674.756S	7	8	Fe	2.82	4.24	

I A	Intensity Disk	Intensity Spot	Ident	E P or Band Data		Notes
8675.370	-1	7	Ti	1.06	2.48	
8675.88	-3					1
8677.12	-3					1
8678.950	-2		S	7.83	9.26	
8679.646	2	1	Fe p–	4.94	6.37	
			S	7.83	9.26	
8680.097	-1	ob	N	10.29	11.71	
8680.405	0	ob	S	7.83	9.25	
8680.82	-3		Fe p	4.17	5.59	1
8681.13	-2		Atm?			1
8681.52	-3		Atm?			1
8681.85	-3		⊙?			1
8682.45	-3		⊙?			1
8682.987	-1	6	Ti	1.05	2.47	
8683.384	-1	-2	N	10.29	11.71	
8686.368	2	-3	(N)	10.28	11.70	40
8686.75	-3	0N	Fe p	3.86	5.29	1
				4.97	6.39	
8687.23	-3		⊙?			1
8687.49	-3		⊙?			1
8687.90	-3		⊙?			1
8688.642	11N	13N	Fe	2.17	3.59	
8689.788	0N	-1N	Fe p	3.03	4.45	
				5.08	6.50	
8692.342	-2	4	Ti	1.04	2.46	
8693.15	-3		S?	7.84	9.26	1
8693.958	0	ob	S	7.84	9.25	
8694.641	2	ob	S	7.84	9.25	24
8698.717	0	0	Fe p	2.98	4.40	
8699.461S	4	1	Fe	4.93	6.35	
8700.314	-2	ob?	Fe p	4.93	6.35	
8700.949	-1N	-2N	Mn	4.41	5.83	
8701.73	-3		Atm?			1
8702.510	-1		Ni	2.73	4.15	
8703.15	-3		N	10.28	11.70	1
8703.73	-2N	-2N	Mn	4.41	5.83	
8704.52	-3N		Atm?			1
8705.18	-2		⊙?			
8706.055	-2		⊙?			
8706.89	-3		⊙?			1
8707.31	-3N		Cr?	2.70	4.12	1,24
8707.942	-3		Cr?	4.37	5.79	
8709.28	-3N		⊙?			
8710.21	-2					1
8710.398	5	3	Fe	4.89	6.31	
8711.671	-2		N	10.29	11.70	
8712.701	2	-2	⊙			
8713.208S	3	3	Fe	2.94	4.35	
				4.97	6.38	
8713.89	-3		Atm?			1
8716.62	-3		Atm?			1
8717.833S	7N	4N	Mg?p	5.91	7.32	
8718.76	-3		Cr?–	4.38	5.80	24
			N	10.29	11.71	
8719.66		0	Ti	1.73	3.15	1
8724.13	-3		⊙?			1
8725.216	-3		⊙?			
8725.95	-3		⊙?			1
8727.19	-3		Fe p	4.17	5.58	

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	E P Data	Notes
8728.024	4	ob	Si	6.15	7.57	
8728.604	-2	ob	Si	6.15	7.57	24
8729.171	1	1	Fe p	3.40	4.81	
8730.22	-3	ob?	⊙			1
8734.74	-3	5	Ti	1.05	2.46	
8736.040	10N	2N	Mg	5.92	7.33	
8737.40	-2	-2	Mn	4.42	5.83	
8738.76	-3N		Atm?			1
8739.50	-3		Atm?			1
8740.24	-3		Atm?			1
8740.85	0d	-1	Mn	4.42	5.83	
8741.68	-2		Atm?			1
8742.466	6N	2N	Si	5.85	7.26	
8743.53	-3		⊙?			
8745.34	-2		⊙?			1
8745.81	-2					1
8747.438S	0	-1?	Fe	3.00	4.42	24
8747.85	-3					1
The bolometer shows diffuse solar absorption in this region due to the ninth line (n = 12) in the Paschen series of hydrogen. See note 20.						
8750.57	-3N					1
8751.198	1N	ob?	Si p	5.85	7.26	
8752.025	6N	2N	Si	5.85	7.26	
8753.11	-3N		⊙?			1
8755.75	-2		⊙			
8757.199	4	6	Fe	2.83	4.24	
8758.466	-2		Atm?			
8759.66	-3		⊙?			
8761.28	-3		⊙?			40
8763.978	6	6	Fe	4.63	6.04	
8764.94	-3NN					1
8766.417	-1	-2	Si	5.94	7.35	
8766.68	-2	5	Ti	1.06	2.47	1
8767.05	-2					1
8767.68	-3Nd?		Fe p	3.64	5.05	1
8770.681	0	-1	Ni	2.73	4.14	
8771.86	-2N		⊙			
8772.57	-1					
8772.884	5	6	Al	4.00	5.41	
8773.906S	6	7	Al	4.00	5.41	
8778.68		1	Ti	1.74	3.15	1
8778.82		1	⊙			1
8779.08	-2		Fe p	4.21	5.62	40
8779.72	-2					1
8780.17	-2	-2	⊙?			24
8780.757	2	ob	⊙			
8784.444S	1	0	Fe	4.93	6.34	
8790.454S	6	3	Fe	4.97	6.37	
			Si	6.16	7.57	
				6.16	7.57	
8792.95	-1	ob				
8793.350S	6	7	Fe	4.59	5.99	
8796.491	2	1	Fe	4.93	6.34	
8798.07	-2	ob	Fe p	4.96	6.37	
8798.55	-2N					1
8798.96	-2					1
8799.942	-1		Atm			
8800.56		0	Y	0.00	1.40	1,24

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	E P Data	Notes
8801.05		0	⊙			1,24
8801.81		0	Fe p	3.93	5.33	1
8802.13	-2	-2	⊙?			1
8802.92		1	⊙			1,24
8803.397	-1		Atm			
8803.52		0	⊙			1,24
8803.82		-1				
8804.637	3	6	Fe	2.27	3.67	
8805.19	-1		Fe p	4.89	6.29	
8806.775	14	16	Mg	4.33	5.73	
8808.173	2	-1	Fe	4.99	6.39	
8808.80	-2N		⊙			1
8809.406	1	0	Ni	3.88	5.28	
8809.825	-2N					1
8811.704	-1		Atm?			
8812.98	-2					1
8814.31	-2d?		-Fe?	5.05	6.45	1
8816.876	-1		Fe p	4.97	6.37	
8818.78	-2					1
8819.16	-2		Co	5.13	6.53	1
8819.35		0d?	Ti	1.06	2.46	
8819.51	0N	1N	Fe p	4.97	6.37	
				4.99	6.39	
8820.231	-1		Atm			
8822.38	-2					
8824.234S	10	15	Fe	2.19	3.59	
8828.103	-1	-1	Fe p	4.93	6.33	
8828.87	-2	-2N	Al	4.07	5.47	
8831.241	-2		Atm			
8832.953	-1	ob	⊙			
8834.025	-1	ob?	Fe p	4.20	5.60	
8835.54	0		Atm			1,40
8835.79	0		Atm			1
			(Cr)	3.07	4.47	
8836.40	-2					
8837.05	-2					
8838.441	6	9	Fe	2.85	4.24	
8839.81	-2	-1	⊙			
8841.23	-1N	0N	Al	4.07	5.47	
8842.60	-2	-1	⊙			
8843.52	-2	-1				1
8844.56	-2					1
8844.83	-2					
8845.42	-2					1
8846.03	-2		Atm?			
8846.750	3	0	Fe	4.99	6.38	
8847.15		-1	⊙			1
8847.59		-2				1
8848.47		-1nl				1
8849.96		2	⊙			
8850.71	-2		Co?			
8850.87		1N	⊙			
8852.351	1N	1N	Atm			
			Fe?p	5.00	6.40	
8853.35		0N	⊙			1
8854.10		-1N	⊙			1
8855.35		2	Ti			
8855.84		0	⊙			1
8857.294	1		Atm			

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
8857.678	1		Atm			
8858.816	2N		Atm			
8859.99	-1	1N	⊙			
8860.78	-1					
8861.95	-1		Atm?			1
8862.06	0	0	⊙			
8862.563	3	4	Ni	4.07	5.46	

The bolometer shows diffuse solar absorption in this region probably partly due to the eighth line in the Paschen series of hydrogen. See note 20.

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
8863.588	1	-1N	Fe	4.94	6.34	
8866.255	1		Atm			
8866.943S	9	12	Fe	4.53	5.92	
8868.444S	3	5	Fe	3.00	4.40	
8869.049	0		Atm			24
8872.347	0		Atm			
8873.38	0N	ob?	⊙			
8874.478	1N	2N	-S?	8.38	9.77	24
8875.28	-1					
8876.030S	1	0	Fe	5.00	6.39	
8877.04	-1	ob	Ni	5.47	6.86	
8877.55	-1	0				
8878.271	1	0w	Fe p	2.98	4.37	
8878.775	0	-1	Fe p	4.17	5.56	
8879.316S	4		Atm			
8880.69	-1N	ob	S	8.38	9.77	1
8882.15	1N	ob	Atm			24
			S	8.38	9.77	
8883.68	0	ob	Si	5.93	7.32	
8884.24	-1	ob?	S	8.38	9.77	24
8885.03		-1				1
8887.07	-1N		Fe p	4.93	6.32	
8891.412	1		Atm			
8892.11	-1	ob?	Fe p	5.01	6.40	
8892.738	4	3	Si	5.96	7.35	
8893.75	-1					
8894.48	0					
8895.98	-1		Fe p	4.42	5.80	1
8896.607	2	-1?	⊙? Atm?			
8897.892	0	-1				
8898.99	1	-1	Atm			
			Si	6.18	7.57	
				6.20	7.58	
8899.222	2	0W	Si?	6.18	7.57	24
8900.626	2		Atm			
8902.926	-1	-1	Fe p	4.97	6.35	
8903.70	-1					
8905.989	1	0	Fe p	5.04	6.43	
8907.245	1N					
8907.538	1					
8909.08	-1					
8911.01	1N					
8912.101	7	3	CaII	7.02	8.40	52
8915.901	-1ns		⊙?			
8916.879	-1					
8917.506S	1		Atm			
8918.643	-1		⊙?			
8919.550	-1		Atm?			
8920.036	3	5	Fe	5.04	6.43	

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
8921.632	0		Atm			
8922.643	0	-2	Fe p	4.97	6.35	
8923.570	3	4	Al	4.07	5.45	
			Mg	5.37	6.75	
8925.288	1	-1W	Si	5.93	7.31	
8925.91	-3	3W	Cr-	3.07	4.45	
8926.881	0		Atm			
8927.392S	7	3	CaII	7.02	8.40	52
8929.072	6	6	Fe	5.06	6.45	
			Atm			
8929.476	-2		Atm			
8930.270S	4		Atm			
8930.82	-3d		Atm?			
8931.76	-1	1N	Fe p	3.03	4.42	40
8932.36	-2N					
8932.97		2	⊙			
8934.075	8		Atm			
8935.890	-1		Atm			
8940.208	4		Atm			
8940.585	2		Atm			
8941.667	-1	-1W	⊙			
8942.338	3		Atm			
8943.058	2	4W	Fe	2.82	4.20	
8944.21	1		Atm			
8945.198	5	6	Fe	5.01	6.39	
8946.336	8nl	9nl	Atm-			
			Fe	2.83	4.21	
8946.878S	4		Atm			
8947.197	0	1W	Cr	3.09	4.47	
8948.615	3		Atm			
8948.908	0		Atm			
8949.06	2N	0	Si	5.94	7.32	
8950.217	-1	-2W	Fe p	4.14	5.52	
8950.744S	1		Atm			
8951.75	2		Atm			
8952.18	3		Atm			
8953.10	-2N		⊙			
8953.62	-2N		⊙			
8953.89	-2		⊙			1
8954.313	5		Atm			
8954.967	9		Atm			
8956.30	-3	-3	Fe p	4.99	6.37	
8956.71	-1		Atm			
8957.72	-1		Atm			
8958.00	-3		Atm?			1
8958.402S	4		Atm			
8959.86	-3N		Fe p	5.00	6.38	
8960.67	-2N		⊙			
8961.31	-3		⊙			1
8961.66	-2		⊙			
8962.34	6		Atm			
8962.59	6		Atm			
8963.492S	4		Atm			
8965.467	5		Atm			
8965.94	-1	ob	Ni	4.09	5.46	
8966.406	4		Atm			
8967.59	-3		Fe p	4.99	6.37	1
8967.72	0	-2W	⊙			
8968.20	1	-3	Ni	5.32	6.70	

I A	Intensity Disk	Intensity Spot	Ident	E P or Band Data		Notes
8969.030S	0		Atm			
8971.09	2		Atm			
8971.56	9d		Atm			
8972.891	1		Atm			
8974.261	2		Atm			
8974.783	3		Atm			
8975.413	1	3	Fe	2.98	4.35	
8976.424S	1		Atm			
8976.88	-1	1	Cr	3.07	4.45	
8978.16	-2	-2	Fe p	3.40	4.77	
				4.99	6.36	
8979.23	-1	-2	TiII?p	2.58	3.95	
8980.488	9		Atm			
8980.643	9		Atm			
8981.428	-1		Atm ⊙?			
8983.83	-3		⊙?			1
8984.361	-2		Atm			
8984.898	1	0	Fe	5.08	6.45	
8986.600	5		Atm			
8987.37	3		Atm			
8987.65	10		Atm			
8988.157	1		Atm			
8989.08	3		Atm			
8989.544	1	4	Atm			
			Ti	1.73	3.10	
8990.830	6		Atm			
8991.700	5		Atm			
8992.014	5		Atm			
8993.043S	0		Atm			
8993.27	-3		⊙?			
8993.60	-3		⊙?			1
8993.98	-3		⊙?			1
8994.66	-3d		Fe p	3.26	4.63	
8997.16	0	-2N	Mg?	5.91	7.28	
8998.885	-2		Atm			
8999.580	3	5	Fe	2.82	4.19	
9000.23	9		Atm			
9000.72	4		Atm			
9003.610	6		Atm			
9003.905	6		Atm			
9005.730	-1		Atm			
9006.81	1		Atm			37
			(Fe)	4.97	6.34	
9007.10	1		Atm			
9007.54	3		Atm			
9007.80	0		Atm			
9008.52	4	1	Fe–	5.05	6.42	
9009.047	2		Atm			
9009.835	3	10W	Cr	3.31	4.68	
9010.573	1	2	Fe	2.60	3.97	
9011.886	9	9nl	Atm			
			Fe	4.97	6.34	
9013.506	-1		Atm			
9013.98	0	4W	Fe	2.27	3.64	
9014.92	-2NN		H	12.04	13.40	
See note 20						
9016.08	-2		Atm			
9016.736	(30)		Atm			
			(Cr)	3.31	4.68	

I A	Intensity Disk	Intensity Spot	Ident	E P or Band Data		Notes
9018.090	3		Atm			
9019.77	0	1	Fe	5.08	6.45	
9020.22	-1	-1	Atm ⊙			
9021.57	3	8	Cr	3.31	4.68	
9022.03	0	ob?	⊙			
9022.638	8		Atm			
9024.38	2	3W	Fe	4.89	6.26	
9024.70	-1	ob?	Fe p	4.97	6.34	
9025.29	0		Atm			
9035.907	9		Atm			
9027.36	-1	3tr	Ti	1.73	3.10	
9027.89	-3NN		-TiII?p	2.59	3.95	
9028.17		-1	⊙			1
9029.391	3		Atm			
9030.31	-2		Atm			
9030.75	0	1	Fe	3.83	4.20	
9031.395	4		Atm			
9032.15	-3		Atm			
9034.911	1		Atm			
9035.88	0	3W	Cr	3.07	4.43	
9036.72	-2N		Fe	4.97	6.33	
9037.76	-2N		⊙?			
9038.79	-2N		Fe p	2.94	4.30	
9040.088	2		Atm			
9041.124	1		Atm			
9042.28	2		Atm			
9042.856	4		Atm			
9047.412S	2		Atm			
9048.536	1		Atm			
9051.07	2		Atm			1
9051.47	1	-3W	⊙			
9052.974S	7		Atm			
9054.30	-3		Atm			
9057.11	-3		Atm			
9058.31	-3		Atm			1
9060.434S	6		Atm			
9061.443	7	ob	C	7.45	8.81	
9061.896	1		Atm			
9062.26	1	ob	Fe	5.06	6.43	1
9062.48	3	ob	C	7.45	8.81	
9062.696	5		Atm			
9064.006	5d		Atm			
9065.452	-1		Atm			
9065.94	-3		Atm			1
9067.654	-1		Atm			
9069.126	12		Atm			
9070.416	1	2W	Fe	4.20	5.56	
				5.06	6.42	
9071.958	12		Atm			
9073.134S	1		Atm			
9074.306S	7		Atm			
9078.28	7	ob?	C	7.45	8.81	
9079.00	2		Atm			
9079.413	2nl	2	Atm–			
			Fe?	4.63	5.99	
9079.847	7		Atm			
9080.532	1Ns	1	Fe–	4.93	6.29	
				5.01	6.37	
			Atm			
9081.307	7		Atm			

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	Data	Notes
9083.34	-2N		⊙			1
9084.22	-2	-2	Fe p	4.24	5.60	1
9085.451	3		Atm			
9086.607	4		Atm			
9087.046	7		Atm			
9088.391	11nl	10	Fe-	2.83	4.19	
			C	7.45	8.81	
9089.422	3	4	Fc	2.94	4.29	
9089.835	2		Atm			
9090.340	1	1	Atm			
9090.72		5	Ti	1.74	3.10	
9091.47	-1N	-2				1
9092.482S	5		Atm			
9093.779	5		Atm			
9094.82	8	ob	C	7.46	8.81	
9095.12	1		Atm			
9095.369	3		Atm			
9098.470	3ns	3ns	⊙? Atm			
9099.22	-2	-2	Ca?p	3.89	5.25	
9099.774	7		Atm			
9100.521	6		Atm			
			(Fe)	4.89	6.25	
9101.52	-1		Atm			
9102.95	-2	ob	⊙			1
9103.67	0	1	Fe	4.16	5.52	
9105.399S	7		Atm			
9106.223	3		Atm			
9106.86	0		Atm			
9107.092	1		Atm			
9107.398	3		Atm			
9108.024	0		Atm			
9108.342	4		Atm			
9109.38	-2N		⊙?			
9110.47	0		Atm			
9111.14	-2N		Atm			1
9111.877	9	0	C	7.46	8.81	
9112.19	-2	ob?	Fe p	4.97	6.32	1
9113.939	0		Atm			
9114.34	-2N	-1N	⊙			
9115.644	3		Atm			
9116.26	1	1W	Fe			
9116.940	2N	3N?	Atm			
			Fe p	4.99	6.34	
9117.08	-1		Fe	2.85	4.20	1
9117.341	-1		Atm			
9118.009S	5		Atm			
9118.920	15		Atm			12
			(Fe)	2.82	4.17	
9120.05	-3		Atm			
9120.76	-1		Atm			
9123.968	0		Atm			
9124.262	1		Atm			
9124.826	1nl		Atm			
9126.612	-2		Atm			
9127.115	-3		Atm			
9127.831	3		Atm			
9128.391	-1		Atm			
9128.619	3		Atm			
9129.210	-1		Atm			
9129.856	3		Atm			
9130.603	12		Atm			
9132.443S	3		Atm			
9134.275	3		Atm			
9134.789	2		Atm			
9135.152	0		Atm			
9135.998	5		Atm			
9136.569	7		Atm			
9137.062	5		Atm			
9139.775	-1		Atm			
9140.12	-3		CN	0, 0		1,40
9140.457S	1		Atm			
9141.119	0		Atm			
9142.659	1N		Atm			
9143.293	-1		Atm			
9143.507	-1		Atm			
9144.134	1		Atm			
9144.560	1		Atm			
9145.646	-1		Atm			
9146.16	3	5	Fe	2.58	3.93	
9146.810	-2		Atm			
9146.997	-2		Atm			
9147.75	-1	-1	Fe	5.04	6.39	
9148.000	0	1	Fe			
9148.645	0nl		Atm			
9150.046	4		Atm			
9150.800S	1		Atm			
9151.719	2		Atm			
9152.067	2		Atm			
9152.606	8d		Atm			
9153.180	7		Atm			
9154.122	-1N	0N	Na?	3.60	4.95	
9155.30	5		Atm			
9155.69	8		Atm			
9155.98	1		⊙?			12
9156.26	0	0	Fe p	3.00	4.35	
9156.75	3		Atm			
9156.93	-1	ob	Fe	4.97	6.31	1
				4.97	6.31	
9157.68	-3		Atm			1
9158.01	-3		Atm			1
9158.694	-3N		Atm			
9159.84	-2		Atm?			1
9160.091	4		Atm			
9160.904	4		Atm			
9162.23	-2		Atm			1
9162.589	1nl		Atm			
9163.859	1		Atm			
9164.196	1		Atm			
9164.570	1	0	Fe	4.89	6.24	
9166.39	-3	-3	Fe?			
9167.293	0		Atm			
9167.926	5		Atm			
9168.769	2		Atm			
9169.353	3		Atm			
9170.17	-3		⊙?			
9170.672	-1		Atm			
9171.02	-2		Atm			1
9171.55	-2		Atm			1

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
9171.76	-1		Atm			
9172.484	3		Atm			
9172.892	2		Atm			
9173.12	-2	-1	Fe p	2.60	3.94	1
9173.73	-1		Fe	3.29	4.63	1
				5.04	6.39	
9174.120	15		Atm			
9174.34	4		Atm			1
9174.82	-2		Atm			
9175.249S	5		Atm			
9176.02	-2		Atm			
9176.48	-3		Atm			
9176.898	7		Atm			12
9178.534S	3		Atm			
			(Fe)	4.93	6.28	
9179.294	-2		Atm			
9181.203S	3		Atm			
9182.063	-1		Atm			
9183.461	2d?		Atm			
9184.402	7		Atm			
9184.965	7		Atm			
9186.476	0N		Atm			
9187.237	-3		Atm			40
9187.81	-3		Atm			1
9188.346	-3		⊙			
9190.208S	3		Atm			
9191.598	1		Atm			
9192.568S	5		Atm			
9193.45	-3		Atm			1
9195.368	9		Atm			
9196.017	5		Atm			
9197.37	-3N		Atm?			1
9198.50	-3		⊙?			1
9199.10	1		Atm			
9199.39	-2	-3	Fe	5.01	6.35	
9200.23	-3		⊙?			1
9200.55	-3		⊙?			1
9200.87	-3		Atm			1
9201.97	-3N		⊙?			1
9203.21	-3d?		Fe p	5.04	6.38	
9204.445	-1		Atm			
9205.584S	3		Atm			
9206.836	2		Atm			
9207.856	2		Atm			
9208.31	0	ob	Cr?	3.11	4.45	1
9208.598	2		Atm			
9209.427	-3		Atm			
9210.036	3	4	Fe	2.83	4.17	
9210.72	-3N		Atm			1,40
9212.838	5	4	Atm			
			S	6.50	7.84	
9213.74	-3		Atm			1
9214.649	7nl		Atm			
			FeII?p	3.87	5.21	
			(Fe)	4.89	6.23	
9215.555	-1		Atm			
9217.015	2		Atm			
9217.276	7d		Atm			
			(Fe)	4.97	6.31	

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
9218.251	3	ob	MgII p	8.62	9.96	
9219.54	-3N		Atm			1
9220.41	-2		⊙			1
9222.015	3		Atm			
9223.99	-1		⊙			
9224.53	-2Nd?		⊙			
9225.0063	6		Atm			
9225.49	-3	-2	Fe	4.56	5.90	1
9226.46	-3	-3	⊙			1
9227.37	-3					1
9228.101	6	0	S	6.50	7.83	
9228.659	1		Atm			
See note 20						
9229.601	1		Atm			
9230.504	1		Atm			
9231.01	-2		Atm			
9231.37	-3		Atm			1
9231.76	-3	-1W	Y?-	0.07	1.40	
9232.750S	3		Atm			
9233.18	-2	-2	Atm			1
			Fe	5.30	6.63	
9234.790	4		Atm			
9235.20	-1	0	⊙			
9235.73	-1	0	⊙			
9235.98	-3	-2	⊙			1
9236.55	-3	-2	⊙			1
9237.23	0		Atm			
9237.56	6	-3N	S	6.50	7.83	
9238.10	4		Atm			
9238.918	3		Atm			
9239.076	2		Atm			
9239.43	-3		Atm?			1
9239.85	-1		Atm			
9240.38	0		Atm			
9240.77	-3N	-3N	Atm ⊙			1
9242.26	1	1	Fe	4.97	6.30	
9242.94	1		Atm			
9243.22	0		Atm			
9244.25	0NN	ob	MgII p	8.62	9.95	
9244.41	1		Atm			
9244.85	2		Atm			
9245.14	-2		Atm			1
9245.60	-2	ob	⊙			1
9245.83	-2	ob	⊙			1
9246.31	6		Atm			
9246.50	1	2W	Fe	2.58	3.91	1
9247.19	-3	-3	⊙			
9248.10	-3		Fe p	5.05	6.38	1
9248.76	0	1	Fe p	4.94	6.28	
9249.50	3ns		Atm			
9251.100S	6		Atm			
9252.412	0	-1	⊙			
9253.06	0		Atm			
9253.71	3	2	Fe?p	4.99	6.32	
			Atm			
9254.347S	1		Atm			
9255.16	0		Atm			
9255.79	10N	8N	Mg	5.73	7.06	
9256.78	-1		Atm			1

I A	Intensity Disk	Intensity Spot	Ident	E P	or Band Data	Notes
9257.06	-1		Atm			
9258.280	3	3W	Fe	4.59	5.92	
9259.063	3	3	Fe	4.89	6.22	
			Atm			
9259.44	-2		Atm			
9260.369	5		Atm			
9260.58	-3		Atm			1
See note 23						
9260.98	0		Atm			
9261.579	0		Atm			
9262.269	2		Atm			
9262.76	0N	ob	O	10.69	12.03	1,23
9263.123	0		Atm			
9263.64	-2	-3	⊙			
9263.93	0	2	Atm			
			Cr	3.10	4.43	
9265.96	2N	ob	O	10.69	12.03	1,23
9266.203	3		Atm			
9267.14	-2		Atm			40
9267.39	-3		Atm			
9268.65	-3		Atm			1
9269.06	0		Atm			
9269.33	0	1	⊙			1
9270.03	-1		Atm			
9270.80	-1N	0	⊙?			
9271.37	-2	-1	⊙			1
9272.24	0		Atm			
9273.08	6d		Atm ⊙			
9274.24	-1		Atm			
9275.072S	2		Atm			
9275.70	-2		Atm			
9276.21	-3	-3	Atm?			
9276.830	1	1	Atm			
			Zr	0.68	2.01	
9277.507	2d?		Atm			
9278.32	-3		Atm?			
9278.826	9		Atm			
9279.736	2		Atm			
9280.116	3		Atm			
9280.79	-2N		Atm			1
9281.85	0		Atm			1
9282.18	0		Atm			
9282.69	2		Atm			
9283.36	-1N	-1N	⊙?			1
9283.98	-1		Atm			1
9284.24	-1		Atm			1
9284.92	8		Atm			
9285.34	-2		Atm?			1
9285.617	0		Atm			
9286.453	5		Atm			
9286.823	3		Atm			
9288.00	-1		Atm			
9288.45	-1		Atm			
9288.63	-1		Atm			
9288.937	1		Atm			
9289.44	-1	-2	Fe p	5.04	6.37	
9289.856S	2		Atm			
9290.468	2	6W	Cr	2.53	3.86	
9290.88	-3N		Atm			1
9291.364	7		Atm			
9292.698	1		Atm			
9293.140	3		Atm			
9293.47	-3		Atm			1
9294.06	-3		Cr	2.53	3.86	
				2.53	3.86	
9294.447	3		Atm			
9294.659	1N	0N	Fe	5.01	6.34	
9295.021	3		Atm			
9295.257	3		Atm			
9296.420	0		Atm			
9297.14	1	1	Fe p	4.71	6.04	
9297.69	4		Atm			
9297.97	1N		Fe p	4.89	6.22	
			Atm?			
9298.22	0		Atm?			
9298.64	1		Atm			
9300.306	5		Atm			
9300.579	3		Atm			
9301.06	5		Atm			
9301.910S	5		Atm			
9302.67	-1		Atm			
9303.30	-3		Atm			
9303.85	10		Atm			12
9304.598	5		Atm			
9305.38	-2N		Atm			
9306.23	0		Atm			
9307.22	4		Atm			
9308.08	(25d?)		Atm			
			(Fe)	5.01	6.34	
9308.84	2		Atm			1
9309.62	(40)		Atm			
9310.88	-3		Atm			1
9311.734S	6		Atm			
9312.657	0ns	0ns	Atm			
9314.006S	4		Atm			
9315.13	15		Atm			
9316.15	(75)		Atm			12, 1
9316.73						1
9318.22	1	-2	Fe	4.93	6.26	
			Si	6.07	7.40	
9319.06	(30)		Atm			12
9320.16	-1		Atm			
9320.768S	7		Atm			
9321.650S	0		Atm			
9322.50	9		Atm			
9323.12	15		Atm			
9324.20	12		Atm			
			(Fe)	5.06	6.39	
9325.30	(60)		Atm			12
9326.66	-3		Atm?			
9327.79	(25)		Atm			
9328.38	-1		Atm			
9328.71	2		Atm			
			(Fe p)	5.00	6.32	
9329.85	-1N		Atm			
9330.456	5		Atm			
9331.02	-2	-1	⊙?			1
9331.477	15		Atm			

I A	Intensity Disk	Intensity Spot	Ident	E P or Band	Data	Notes
9333.57	(50)		Atm			12
			(Fe)	4.97	6.29	
9334.58	(40)		Atm			13
9335.29	−1	−1	Atm			1
			Fe?p	5.05	6.37	
9335.63	1		Atm			1
9336.02	8		Atm			
9336.52	1		Atm			
9337.184	9		Atm			
9337.80	2		Atm			
9338.47	12		Atm			
9339.43	(50)		Atm			12
9341.478	−2		Atm			
9342.45	(150)		Atm			12
			(Fe)	5.01	6.33	
9344.0						
9345.5	(50)		Atm			12
9346.41	4		Atm			
9346.79	2		Atm			
9346.99	3		Atm			
9347.582	1	1	⊙?			
9348.382S	2		Atm			
9349.22	ON	ON	Atm? ⊙?			
9350.451	9		Atm			
			(Fe)	4.53	5.85	
9351.97	0		Atm			
9353.0						
9353.6	(100)		Atm			12,13
9354.4						
9355.19	4		Atm			
9356.52	3N		Atm?			
9357.5	(100)		Atm			12,13
9358.9						
9359.39	1	2W	Fe	2.55	3.87	
9360.15	−1		Atm			
9360.61	0		Atm			
9361.227S	6		Atm			
9361.85	0		Atm			1
9362.31	1ns	3	Cr?−	2.90	4.22	1
			Fe	2.27	3.59	
9363.334S	3		Atm			
9364.08	−3					1
9364.85	(40)		Atm			12
9366.41	(50)		Atm			12
9367.32	3		Atm			
9368.17	−1	−2	⊙			1
9368.62	−2		Atm?			1
9369.53	(60)		Atm			12
9370.12	1		Atm			1
9371.57	(100)		Atm			12
9372.86	2	1N	Fe	2.55	3.86	
9373.14	3		Atm			
9374.280S	1		Atm			
9375.240	8		Atm			
9375.68	ON		Atm?			
9376.30	−1N		Atm?			
9377.05	0		Atm			1
9377.63	(75)		Atm			12
9379.552	15		Atm			
9379.721						
9381.18	(80)		Atm			12
9382.18	5		Atm			
9382.98	−1	ob	Fe	4.96	6.28	
9383.423	−1		Fe p	4.96	6.28	
9383.583	6		Atm			
9385.24	−2		Atm			1
9385.77	−2		Ni−	4.15	5.46	1
9386.83	(50)		Atm			12
9387.82	7		Atm			
9390.79	2nl		Atm			
9391.763	8		Atm			
9392.18	ON		Atm?			
9392.80	−1		Fe p	4.99	6.30	
9393.04	−3		CN		1, 1	40
9393.41	ON		Si	6.10	7.41	1
9393.89	−1		⊙?			
9394.241	2		Atm			
9394.472	3		Atm			
			(Fe?)	4.93	6.25	
9396.261	3		Atm			
9396.68	−3		Ni			1
9396.90	−3		⊙?			
9397.57	−2					1
9399.03	(30)		Atm			
9400.094S	7		Atm			
9401.14	1N	−1N	Fe	5.01	6.32	
9401.621	8		Atm			
9402.61	3		Atm			
9403.27	1	0	FeII p	3.89	5.20	
9403.73	3		Atm			
9404.48	2		Atm			
9404.90	1	2	Fe p	4.97	6.28	
9405.36	0		Atm			
9405.74	5N	ob?	C	7.65	8.96	
9405.95	1		Atm			
9406.30	−1		Atm			
9406.904S	8		Atm			
9407.99	−3		⊙?			1
9409.042	8		Atm			
9409.59	−3NN		Fe p	5.01	6.32	1
9410.37	(50)		Atm			12
			(Fe)	5.08	6.39	
9411.31	2		Atm?			
9411.84	0		Atm			
9412.66	2		Atm			
9413.512	4		Atm			
			Si	5.06	6.37	
9414.08	3		Atm			
			(Fe)	5.04	6.35	
9414.95	10N	10N	Mg	5.92	7.23	
9416.01	−1N		Atm?			
9416.76	2		Atm			
9417.65	(50)		Atm			
9419.28	−2		Atm			1
9420.06	0		Atm			

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
9420.75	3		Atm			
9421.824	(30)		Atm			12
9423.14	-2		Fe p	5.08	6.39	1,43
9424.75	-1		Atm			
9425.02	-2		⊙			
9426.26	0NN					
9426.86	(70)		Atm			12,13
9428.20	(60)		Atm			12
9429.79	-2		Atm?			
9430.00	-2		Fe			
9430.62	(40)		Atm			12
9431.27	-2		Atm?			1
9431.58	-3		Atm?			1
9431.90	-2		Atm			
9432.10	-2		Atm			
9432.73	0		Atm ⊙			
9433.34	-3		Fe p	5.01	6.32	1
9434.04	-3		Atm			1
9434.78	1NN	1NN	Mg?p	5.91	7.21	43
9436.94	-1N		Atm			1
9437.82	(50)		Atm			12
9438.73	-1N		Atm			
9440.85	(80)		Atm			12
9442.415	5		Atm			
9443.35	(50)		Atm			12
9443.78	1		Fe	5.06	6.37	1
9444.412S	5		Atm			
9444.95	0	0	⊙			1
9446.01	15		Atm			
9447.03	3	10	Cr	2.53	3.84	31
				2.53	3.84	
9448.09	-3		Fe			1
9449.173	4		Atm			
9449.75	-1N		Atm			
9450.320	6		Atm			
9451.35	-2		⊙			43
9451.89	-3		Atm			
9452.64	-1		Atm			
			Fe	4.97	6.28	
				4.99	6.29	
9453.12	-2					
9454.10	12		Atm			
			(Fe)	5.08	6.38	
9454.66	12		Atm			
9456.10	(50)		Atm			12
9456.90	4		Atm			
9457.840	-2		Atm			
9458.69	-2N		Atm			
9460.02	(50)		Atm			12
9461.12	(60)		Atm			12
9462.94	2	1W	Fe	4.93	6.24	
9463.992S	3		Atm			
9464.81	4		Atm			
9465.48	8		Atm			
9465.98	-2	0	Na	3.60	4.91	
9467.065	3		Atm			
9467.796	4		Atm			
9468.67	9		Atm			
9469.416	(30)		Atm			

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
9470.460	8		Atm			
9471.513	-2		Atm			
9472.418S	1		Atm			
9472.980	0		Atm			
9473.19	-1		Atm			
9474.12	3		Atm			1
9474.42	6		Atm			
9475.05	4		Atm			
9475.27	4		Atm			
9475.99	5		Atm			
9476.23	-1		Atm?			
9476.754S	4		Atm			25
9476.92	-2		Atm?			
9478.36	-3		Atm?			
9478.884S	0		Atm			25
9479.09	-1		⊙			
9480.16	(50)		Atm			12
9481.18						
9481.80	(100)		Atm			12
9482.38						
9482.90	-3		Fe?p	5.00	6.31	1
9483.14	-3					1
9483.970S	1		Atm			
9485.02	1		Atm			
9485.40	0		Atm			
9486.042S	7		Atm			
9486.88	2		Atm			
9487.41	7		Atm			
9489.11	-3	-2?	⊙?			
9489.796	3d		Atm			
9491.00	-3		Atm?			1
9491.526	2		Atm			
9492.97	1		Atm			
9493.41	8		Atm			
9494.26	(50)		Atm			
9495.50	-1N		⊙?			1
9496.17	-2		Atm			1
9496.60	0		Atm			
9497.43	(35)		Atm			
9498.785	2		Atm?			
9499.318	4		Atm			
9499.699	5		Atm			
9501.15	(100)		Atm			12
9502.72	-2N		Atm?			
9503.26	0		Atm			
9504.434S	3		Atm			
9505.634	6		Atm			
9506.02	1	2	Ti	3.57	4.87	
9506.71	-2		Atm			
9507.742S	1		Atm			
9508.36	-1	0?	Atm			
			Ti	3.55	4.85	
9508.774	1		Atm			
9509.27	-2N		Atm			
9510.23	-3N		Atm			
9510.758	6		Atm			
9511.18	-3		Atm			
9512.630S	5		Atm			
9513.23	1	0N	Fe	5.01	6.31	1

I A	Intensity Disk	Spot	Ident	E P	or Band Data	Notes
9513.594	3		Atm			
9513.760	4		Atm			
9514.478	6		Atm			
9516.26	4		Atm?			
9517.04	(60)		Atm			12
9518.00	4		Atm			
9519.32	(20)		Atm			12
9520.03	3	2	Ni	4.15	5.45	
9520.54	2		Atm			
9522.25	(60)		Atm			12
9523.566	3		Atm			
9525.102	(20)		Atm			
9525.95	-3		Atm			
9526.87	1		Atm			
9527.524	5		Atm			
			(Fe)	5.04	6.34	
9528.47	15		Atm			
9528.83	2		Atm?			
9529.440	8		Atm			
9531.226	3	4	Atm			
			Fe p	5.04	6.34	
9531.726	4		Atm			
9532.40	-3		Atm			1
9533.411S	4		Atm			
9534.24	3		Atm			
9534.80	1		Atm			
9535.20	-2		Atm?			
9536.05	(50)		Atm			
9537.17	-3		Atm			
9538.330	7		Atm			
9538.532	3		Atm			
9539.88	-2N		Atm			
9540.900	15d		Atm			
9541.23	-2					1
9541.54	-3					
9542.29	-3N		Atm			
9543.24	-1N					1
9544.06	(60)		Atm			12
9545.84	6	6nl	Atm–			
			Ti	0.83	2.13	
See note 20						
9546.57	3		Atm			
9547.08	0		Atm ⊙?			
9547.39	-3	-2	Zr	0.65	1.94	
9548.60	-1		⊙			
9548.77	9		Atm			
9549.958S	2		Atm			
9550.34	1		Atm			
9550.962S	2		Atm			
			(Fe)	4.97	6.26	
9552.04	-2		Atm			
9552.63	-3		⊙?			
9553.41	(25)		Atm			12
9553.95	3		Atm			
9554.44	9		Atm			
9555.28	-3					1
9556.053	9		Atm			
9556.40	-2					1
9557.28	(50)		Atm			12

I A	Intensity Disk	Spot	Ident	E P	or Band Data	Notes
9558.400	4		Atm			
9558.836S	2		Atm			
9559.66	-3		Atm			
9560.51	-4		Atm			
9560.68	-3		Atm			
9561.09	-3		Atm? ⊙?			
9561.86	-3		⊙?			
9562.456	4		Atm			
9562.744	5		Atm			
9563.870	9		Atm			
9565.06	(25)		Atm			12
9566.59	(40)		Atm			
9567.80	-3		Atm			
9568.23	-3		Atm?			1
9568.647						
9568.786	(30)		Atm			
9568.987						
9569.93	2	0	Fe	4.97	6.26	
			(Si)	5.85	7.14	
9570.32	3		Atm			
			(Si)	6.06	7.35	
9570.95	2		Atm			
9571.32	6nl		Atm			
			Cr	2.53	3.82	
9572.56	-3	-2	Fe			
9572.811	1		Atm			
9573.19	-3					1
9573.65	-3N		Fe p	5.06	6.35	1
9574.29	3	5	Cr	2.53	3.82	
9574.91	0	-1	⊙			
9575.680S	3		Atm			
9576.48	-1N	ob?	⊙			1
9577.036	6		Atm			
9578.89	-3		Atm			1
9579.26	2		Atm			
9580.00	(25)d		Atm			
9581.09	(25)		Atm			12
9581.80	7		Atm			
9582.86	-3N		Atm?			
9583.587	1		Atm			
9584.20	-3		⊙			
9584.71	1		Atm			
9585.70	-2		Atm			
9585.934	3		Atm			
			Si	4.91	6.20	
9586.36	-2		Atm			
9587.126S	5		Atm			
9588.54	15		Atm			
9589.10	10		Atm			
9589.52	4		Atm			
9590.21	10		Atm			
9591.22	10		Atm			
9591.95	5		Atm			
9592.52	10		Atm			
9594.17	6		Atm			
9594.79	7		Atm			
9595.96	-3		⊙			1
9596.423	3		Atm			
9596.96	-1		⊙?			

I A	Intensity		Ident	E P		Notes
	Disk	Spot		or Band	Data	
9597.608	5		Atm			
9597.974	5		Atm			
9598.870S	7		Atm			
9599.51	ON	3	Atm			
			Ti	0.82	2.11	
9599.78	-3		Atm?			
9600.35	0		Atm			
9600.53	0		Atm			
9601.170S	3		Atm			
9601.50	-3		Atm			
9602.05	-3		Fe	4.99	6.28	1
9603.143)	4Nd	-1N	C ⊙	7.45	8.73	
9603.490)	1		Atm			
9604.56	4		Atm			
9605.20	12		Atm			
9606.171	6		Atm			
9607.24	-3					
9607.888	3		Atm			
9608.224	3		Atm			
9608.93	-3		Atm			
			Fe?p	4.96	6.25	
9609.42	-3		Atm			
9610.047	9		Atm			
9610.61	2		Atm			
9611.30	-3N		Atm?			
9611.66		-2	V	1.95	3.23	1
9612.18	-3		⊙?			1
9612.56	-2		Atm			
9613.36	-3		Atm?			1
9614.048	3		Atm			
9615.00	6		Atm			
			(V)	1.94	3.22	
9615.45	4		Atm			
9616.27	-3		Atm			1
9618.10	8		Atm			
9618.51	0		Atm			
9620.030	7		Atm			
9620.98}	2N	ob	<u>C</u>	7.45	8.73	
			Fe p	3.53	4.81	
9621.20}	10		Atm			
9622.32	-2		Atm?			1
9622.706	9		Atm			
9624.496S	3		Atm			
9625.322	1N		Atm			
9625.77	3		Atm			
9626.36	10nl	10	<u>Atm</u>			
			Fe	5.01	6.29	
9628.14	2		Atm			
9628.67	2		Atm			
9629.18	ON		⊙			40
9629.35	-1N		⊙			1
9629.997S	1		Atm			
9630.38	-2		⊙			
9631.03	-2		⊙			
9631.87	-2		⊙			
9633.08	-2		⊙			
9633.488	2		⊙ Atm?			
9634.17	1	2W	Fe	5.04	6.32	31
9634.74	0		⊙			
9635.41	0		CN		2, 2	40
9635.81	2		Atm			
9636.11	1		Atm			
9636.41	2		Atm			
9636.80	1					
9637.49	(25)		Atm			
9638.39	2	5	<u>Ti</u>	0.84	2.13	
			Atm			
9640.172	3		Atm			
9640.519)	4		Atm			
9640.632)						
9642.01	-3N		Atm?			1
9643.105S	3		Atm			
9645.12	15		Atm			
9645.55	10		Atm			
9646.486	9		Atm			
9647.34	0	4	Ti	0.81	2.09	
9648.23	-3		Atm			
9648.661	3		Atm			
9649.487	1		Atm			
9650.226	0		Atm			
9650.850	-1		Atm			
9651.932S	2		Atm			
9652.24	-3		Atm?			
9652.840	4		Atm			
9653.14	2	-1	Fe	4.71	5.99	
9653.44	-2		Atm			
9653.78	-3	ob?	⊙?			
9654.20	-2		Atm			
9654.662	4		Atm			
9655.860	-1		Atm			
9656.203	0		Atm			
9657.331	5		Atm			
			(Fe)	5.06	6.34	
9658.40	8N	-1N	-C	7.46	8.73	
9659.07	-1	-3	Fe	5.04	6.32	
9659.729	4		Atm			
9660.878	5		Atm			
9661.73	-1		Atm			
9662.31	(25)		Atm			
9662.97	-1		Atm			
9663.26	1		Atm			
9663.95	0		Atm			
9664.646S	6		Atm			
9664.97	-3		Atm			
9666.54	-1		Atm			
9666.71	-1		Atm			
9667.048	1		Atm			
9667.316	1		Atm			
			(Cr)	2.53	3.81	
9668.238	1N		Atm			
9669.57	-3		⊙?			
9669.96	4		Atm			
9670.61	10		Atm			
			(Cr)	2.53	3.81	
9672.22	-3					1
9672.82	-3		⊙			1
9673.73	-3		⊙?			1
9674.41	-3		Atm?			1

I A	Intensity Disk	Intensity Spot	Ident	E P	or Band Data	Notes
9675.27	-3		Atm?			1
9675.571	4	10	Ti	0.83	2.11	
9676.16	-1		Atm?			
9676.96	-3					1
9680.383	15		Atm			
9681.00	1		Atm			
9681.74	2		Atm			
9682.44	-3		Atm			
9682.70	-3		⊙			
9684.16	0N	1N	Atm			
			V?			
9685.79	-2N	-1N	⊙ Atm?			
9686.386S	3		Atm			
9687.23	-2					1
9688.04	-3		Atm			
9688.644	1nl		Atm			
			Ca?	4.72	5.99	
9688.87		10	Ti	0.81	2.08	
9689.37	2	ob	Si	6.07	7.35	
9690.172	-1		Atm			
9691.87	5		Atm			
			(V)	1.94	3.21	
9692.24	-3	-2	⊙?			
9693.62	-3N		Atm			1
			Fe	5.06	6.34	
9693.98	-3N					
9694.588S	0		Atm			
9694.872	0		Atm			
9695.35	-3					1
9695.83	-3					1
9696.31	-3					1
9697.24	-3N		Atm			
9698.313	4		Atm			
9699.75	1	2	Atm			1
			Fe	5.04	6.31	
				5.04	6.31	
9700.139S	2		Atm			
9700.83	-3		Atm			1
9701.428	10nl		Atm			
			(Ca)	4.72	6.00	
9705.366	0		Atm			
9705.679	0	10	Ti	0.82	2.09	
9706.00	-2		⊙			1
9706.80	-1		⊙			1
9708.922S	6		Atm			
9710.68	-3		Atm			
9712.53	-3		Atm			
9712.78	-3		Atm			
9714.00	-3					1
9715.310	12		Atm			
9716.54	-3		Atm			
9716.80	-3	-1N	Ti	2.30	3.57	
9718.92	-3	3	Ti	1.50	2.77	
9719.72	-2		Atm			
9720.48	-3N		Atm			1
9720.78	-3N		Atm			
9721.80	-3		⊙			1
9722.28	-3					
9723.167	5		Atm			
9723.66	-3		Atm?			1
9724.576	4		Atm			
9726.27	-3		Atm			
9726.70	-1		Atm			
9727.19	-3					
9727.72	-1		Atm			
9727.94	-1		Atm ⊙?			
9728.55	-1	5	Ti	0.81	2.08	
			Atm			
9729.04	-3N		Atm			
9730.638S	4		Atm			
			(Cr)	3.54	4.80	
9731.32	-3		Atm			
9732.10	-3					1
9733.11	-3		Atm?			
9734.59	1	3	Atm			
			Cr	2.53	3.80	
9735.004	7		Atm			
9736.36	3		Atm			
9736.78	3		Atm			
9737.22	1		Atm?			
9737.86	1	2	⊙			
9738.529	5	7	Atm			
			Fe	4.97	6.24	
			(V)	1.93	3.20	
9739.10	-3		Atm			
9739.74	-3		Atm			1
9740.63	-3N		Atm			
9741.73	-1		Atm			
9743.50	6d?	6d?	Atm-			
			Ti	0.81	2.08	
9745.05	-2N		Atm			
9746.56	-3		Atm			
9746.90		-2N	Ti	2.31	3.57	1
9747.26	-3		Fe	4.56	5.83	1
9747.84	-3		Atm			
9749.322	12		Atm			
9752.72	-3		Atm			
9753.10	-2	0	Fe	4.77	6.04	
			Atm?			
9753.825	8		Atm			
9755.280	-1nl		Atm ⊙			
9755.979S	0		Atm			
9757.04	-3					
9757.704	9		Atm			
9758.58	0		Atm			
9759.26	-3		Atm			
9761.81	3		⊙ Atm			
9762.86	10d		Atm			
9763.32	3	4	Fe	5.08	6.34	
9763.86	-1N	ob	Fe	5.01	6.28	
9764.13	-1N		Atm?			
9764.37	-3		Fe p	5.42	6.69	
9765.495S	4		Atm			
9768.33	-1N	ob	Si	4.93	6.20	1
9768.637S	2		Atm			
9769.74	-3					1
9770.30	-3	5	Ti	0.84	2.11	
9771.07	-3		Fe p	4.56	5.84	1

I A	Intensity Disk	Intensity Spot	Ident	E P	or Band Data	Notes
9771.54	-3					1
9772.16	-3		Atm ⊙?			
9773.887	4		Atm			
9774.43	-3		Atm			
9775.31	-3		Atm			
9776.04	-3		Atm			
9776.818S	3		Atm			
9777.34	-3N		⊙			1
9777.71	-3		⊙			1
9778.19	-3		⊙			1
9778.82	-3		Atm ⊙?			
9779.406S	5		Atm			
9779.78	0		⊙			
9781.15	-1		⊙			
9781.48	-2		⊙			
9782.403	9		Atm			
9783.23	-3N)	10N	Ti	0.83	2.09	
9783.59			Ti	0.81	2.08	
9783.93	-3		Fe	4.97	6.23	
9785.20	-3N					
9785.96	-3N		Atm			
9786.66	-3		Fe	4.59	5.85	
9787.146S	3		Atm			
9787.67	-3	3	Ti	0.82	2.08	
9788.95	-2	-3	Atm			
			Si?	6.06	7.32	
9789.43	-2		Atm			
9789.95	-3					
9791.006S	7		Atm			
9791.39	-3		Atm?			1
9792.71	0		Atm			
9793.354	8		Atm			
9794.56	-3		⊙			1
9795.288S	1		Atm			
9796.08	-3					1
9796.73	-3		P	6.96	8.21	
9797.72	-3		Atm			
9798.30	-3		Atm			
9799.476S	7		Atm			
9800.29	-1	0N	Fe	5.06	6.32	
9800.80	-3		Fe p	5.08	6.34	
9801.699	9		Atm			
9802.04	-3		⊙?			
9803.241S	3		Atm			
9803.98	-3		⊙			1
9805.21	0		Atm			
9806.23	0N		Atm			
9807.35	-3					1
9808.08	-3		Atm			1
9808.559	-1		Atm			
9810.263	-2		Atm			
9811.47	-3		Fe	4.99	6.25	
9812.238	0		Atm			
9813.461	3		Atm			
9815.626	0		Atm			
9816.13	-2		Atm			
9816.569	-1		Atm			
9817.715	3		Atm			
9818.60	-2		Atm			1
9821.754S	3		Atm			
9822.36		-3	Zr	0.62	1.88	1
9823.72	-2d		Atm			1
9824.776	3		Atm			
9825.521	5		Atm			
9826.403	2		Atm			
9830.913	0		Atm			
9831.960S	4	4nl	Atm-			
			Ti	1.88	3.13	
9832.97	-3		⊙			1
9834.12	1	0	Fe	4.97	6.22	1
9835.758S	1		Atm			
9837.13	-3N					1
9837.71	-3N					1
9838.49	-3		Atm			
9839.36	1	-1N	Si	6.06	7.31	1
			Fe	4.56	5.82	
9840.092S	-1		Atm			
9841.45	-3		Atm			1
9842.593	3		Atm			
9843.978S	2		Atm			
9844.94	-3N		⊙ Atm			
9845.99	-3		Atm			
9847.58	-2		Atm			
9848.893)	3		Atm			
9849.119)	0		Atm			
9850.524S	-1		Atm			
9854.66	1N	-3NN	⊙			
9856.59)	-3		Atm			
9856.95)	-3		Atm			
9857.29	-2		Atm			37
9861.746	1	1N	Fe	5.04	6.29	
9864.36	-2N					1
9865.522	0		Atm			
9867.81	-3					
9868.12	0N	0N	Atm			
			Fe	(5.06	6.31	
				5.06	6.31	
9868.89	-2		Atm?			
9870.278	0		Atm			
9871.33	-3		⊙			1
9872.25	-3N					1
9873.638S	4		Atm			
9873.912	0		Atm			
9874.61	1N		⊙?			
9878.200S	1		Atm			
			Fe p	4.97	6.22	
9878.53	-1					
9879.71	-1N		Atm			
9880.81	-2					
9881.54	0		Fe	4.56	5.81	1
9882.59	-3					1
9884.51	0		Atm			
9885.41	-3					
9885.99	-1					
9887.05	1	-1	Si	6.20	7.44	
9888.00	1	2	⊙			
9889.050S	5	7	Fe	5.01	6.26	
9890.67	3ns	-3	⊙			

I A	Intensity		Ident	E P		Notes
	Disk	Spot		or Band	Data	
9891.61	2N	0	Si	6.10	7.35	
9892.80	-3					1
9893.72	-3					1
9894.11	0		Atm			
9894.87	1		Atm			
9896.18	0N		Atm			
9897.43	1		Atm			
9898.13	0N					
9898.965	5		Atm			19
			(Ni)	4.22	5.46	
9899.45	-2					
9899.81	1					
9900.80	1		Cr?	2.97	4.22	24
9901.68	1		CN		3, 3	40
9903.69	-3N		P?	7.14	8.39	1
9905.17	1N					
9907.83	-3					1
9908.40	3		Atm			
9910.27	0		⊙?			
9910.84	0		⊙?			
9911.88	-1N		⊙?			
9913.19	2	1N?	Si	6.07	7.32	
			Fe p	4.97	6.21	
9913.76	-2		Atm?			
9915.39	1					
9916.42	-2					
9919.35	0N		⊙?			
9920.27	1		Atm			
9920.54	-1		Fe p	5.08	6.32	
9922.23	-3					1
9922.88	-1		Atm			
9923.54	-3	0N	Ti	(2.17 3.43	3.41 4.67	
9924.41	0	1N	Fe p	3.53	4.77	
9925.17	-3					1
9926.37	5		Atm			
9926.79	0		Atm			
9927.20	-2N		⊙			
9927.47	-2N	3N	Ti	1.87	3.11	
9929.00	1N1	1N1	⊙?			
9929.80	-3		⊙			1
9930.49	0N	1N	⊙			
9931.45	3ns	ob	⊙			
9932.65	-3N		⊙?			1
9934.44	0		⊙			
9935.82	-2					
9937.09	-3N		Fe p	4.57	5.82	
9939.47	-2					
9940.06	-2					
9941.46	2N	4N?	(Ti)	2.15	3.39	40
9943.08	-3					
9943.57	-3					
9944.220	3	2	Fe	4.99	6.23	
9946.38	-3					1
9948.52	-1					
9949.05	-2	2	Ti	2.14	3.38	
			Cr	3.54	4.78	
9949.88	-1		Si?	(8.37	9.62	40
				8.37	9.64	
9950.62	0		Fe p	4.57	5.81	
9951.19	0		Fe p	5.37	6.61	
9952.00	-1					
9953.51	-1		Fe p	5.42	6.66	
9954.42	-3					
9955.61	-1					
9955.89	-1		Fe p	4.56	5.80	
9956.97	0					
9957.69	-2					1
9959.22	-2N		Fe?p	4.06	5.30	
9961.38	0N	4	Na	3.60	4.84	14
9964.22	-3					1
9964.69	-2					1
9965.84	-3					
9967.30	3ns	4ns	-Fe p	5.06	6.30	
9969.19	1NN1	0N	Si?	6.05	7.29	
9970.23	-2		Fe p	3.00	4.24	
9970.80	-3					
9973.33	-2					
9974.64	0	1	⊙?			
9975.84	-2	-2				
9977.10	2		Atm			
9977.69	-1		Fe	5.04	6.28	
9978.90	-3N					1
9979.50	-3					1
9980.48	2	2	Fe	5.01	6.25	
9981.15	-3N		Ti?			1
9982.03	-1	0	⊙			
9983.23	-1	1N	⊙			
9984.18	1		Atm			
9986.490	3	0	⊙			
9987.22	-3					1
9988.29	-3					1
9988.96	0	2	⊙			
9993.17	5N	2N	Mg?	5.91	7.14	
9994.94	2N	3N	⊙			
9996.12	-2					
9997.665	2	ob?	⊙			
9997.87		5	Ti	1.87	3.10	
9999.21	2N	2N	⊙			
10001.31	-1		Si?p	6.06	7.29	
10002.49	-1					
10003.19	-3	1N	Ti	2.15	3.38	1
10006.81	-2					1
10008.72	0N	2N	⊙			40
10010.12	-2					
10010.60	-2					
10011.65	-3	1	Ti	2.14	3.38	
10012.21	-2		Fe p	5.05	6.28	1
10013.93	-1					
10015.72	-3					
10016.76)	2		Fe p	5.06	6.30	
10016.92	4		Atm			
10017.48	-3					
10018.65	2		Atm			
10019.81	0	1N	Fe p-	5.45	6.69	
10020.84	-2					
10021.67	2		Atm			
10022.24	-1	-1	Fe p	5.48	6.71	
10022.74	-1	0	⊙?			

I A	Intensity Disk	Spot	Ident	E P or Band Data		Notes
10023.52	2		Atm			
10025.86	2N	ON	Si p	6.06	7.29	
10028.39	-1					
10031.81	-2					1
10032.24	-2					1,40
10032.89	0	0	Fe p	5.48	6.71	
10034.51	-2	4	Ti	1.45	2.68	
10035.78	-2					
10036.670	5	4W	SrII	1.80	3.03	
10037.12	2		Atm			
10037.91	-2					
10039.33	-3N					1
10040.18	-3					1
10040.33	-3					1
10041.68	3ns		⊙ Atm			
10045.10	-3					1
10048.30	-3					
10048.90		2	Ti	1.44	2.67	
10049.27	(50NN)	ob	H	12.04	13.26	20
			(Ni)	4.22	5.45	
10051.37	-3N					1
10053.33	3		Atm			
10054.18	-2					
10055.15	-2					
10056.12	-2					
10057.11	-3					1
10057.68	2	10	Ti	2.17	3.39	
			(Fe)	5.01	6.24	
10058.36	-3	-1	Fe p	2.19	3.42	
10059.00	1		Atm			
10059.81	-3	3	Ti	1.42	2.65	1
10061.37	-2		Ni	5.47	6.70	1
10063.49	-2					
10064.05	-1					
10065.070	8	10	Fe	4.81	6.04	
10066.21	-2n	-1N	-Ti	2.15	3.38	
10067.27	-3					1
10068.39	2	1N	Si?	6.07	7.30	
10069.66	1					
10070.58	-2		Fe p	5.49	6.71	
10071.86	1		Fe			
10073.53	-2					
10075.63	-3					1
10077.665	3		Atm			
10078.64	-2		Co?	2.69	3.91	1
10079.08	-1N	0				
10080.43	-1	0	Cr?-	3.54	4.76	
			Fe p	5.08	6.30	
10081.43	0	0	Fe p	2.41	3.64	
10081.87	0		Atm			
10084.41	0	0	Fe p	4.56	5.79	
			(P)	7.18	8.41	
10085.21	-2	-1N	⊙			
10086.31	-1	ON	Fe p	2.94	4.16	
10087.140	3		Atm			
10088.31	-3N					1
10089.21	-2					1
10089.67	ON	1N	⊙			
10091.43	2nl		Atm ⊙?			
10092.15	-2					
10092.745	3		Atm			
10093.47	-2					
10094.91	1	1	⊙? Atm			
10097.59	1					
10098.60	-1		⊙			
10099.89	1		Atm			
10103.47	-2					
10105.77	1ns					
10109.87	-3					
10111.69	-2					1
10111.93	-3					
10113.28	-2		N?	11.71	12.93	
10114.06	1	2	Fe	2.75	3.97	
10114.75	-3					
10115.34	0		Atm			
10116.51	-3					
10117.74	-3		Fe p	5.01	6.23	1
10118.995	3		Atm			
10120.48	-2		⊙			40
10121.20		-2d?	-Ti	2.17	3.38	
10123.895	8	4	HeII??	50.80	52.02	55
10124.83	-2N					1
10128.30	-1N					1
10129.38	0					
10135.06	-3					1
10137.14	-1		Fe p	5.06	6.28	
10138.17	-3					1
10140.66	-2					1
10141.09	-1					
10142.10	-2					
10142.85	0	-3	Fe	5.04	6.26	
10143.48	-3		Fe p	3.87	5.08	1
10145.03	-3		Fe?p	3.24	4.45	1
10145.580	9	12	Fe	4.77	5.99	
			(Ni)	4.25	5.46	
10149.13	-3		Fe p	5.08	6.29	
10149.84	-3	0	⊙			
10152.36	-3					
10153.096	3nl	3nl	Si p	5.85	7.06	
			Fe?p	5.42	6.64	
10154.67	-3					
10155.19	1	3	Fe p	2.17	3.38	
10156.16	0	-1?	Si	6.07	7.29	1
10156.56	0	1?	Fe p	4.57	5.79	1
10161.97	-3	1				1
10165.56	0					
10166.94	-2					
10167.50	2	5	Fe	2.19	3.40	
10170.58	-3	ON	Ti	1.44	2.65	
10172.095	2		Atm			
10173.52	-2					
10179.87	-1	1	Ti?	3.87	5.09	
10183.58	-1					
10189.26	-3	ON	Ti	1.45	2.67	
10190.70	2	2	⊙?			36
10191.12	1	1	⊙?			36
10191.50	2	2	Fe?p	2.41	3.63	36
10193.245	4	5W	Ni	4.07	5.28	

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
10194.24	-3d?					1
10195.12	2	4	Fe	2.72	3.93	
10198.43	-2					
10201.08	-1					
10202.32	-2					
10210.19	-1Nd?					
10212.52	-3					1
10213.49	-2					
10214.45	0		⊙?			
10214.67	0		⊙?			
10216.335	10	12	Fe	4.71	5.92	
10217.77	-3					
10218.415	3	6	Fe	3.06	4.27	
10222.09	-3					1
10222.22	-3					
10225.15	-3					1
10226.640	2		Atm			
10227.93	1ns	-1ns	⊙			
10229.37	-3					
10230.80	1	1W	⊙			
10232.71	0N	0N	⊙			
10234.30	-3		⊙?			
10235.03	-1	0	⊙			
10236.045	2	2	⊙ Atm			
10237.260	3		Atm			
10241.39	-2	0	⊙			
10243.00	-3					1
10243.74	0	-2	⊙			
10244.52	-2					
10247.04		-3N	⊙			1
10249.14	-3					
10250.13	-2	0	⊙			
10252.57	-1	0	⊙			
10254.36		-2	⊙			1
10254.94	0					
10258.28	-3					
10260.20	-2					
10262.52	-2		Si?p	6.06	7.26	
10265.22	-2	-1W	Fe p	2.21	3.42	
10270.23	1		Atm			
10271.24	-3					
10272.950	1		⊙? Atm			
10273.70	-2		Ca?p	4.52	5.72	
10277.31	-1	ob?	⊙			
10283.340	0	-1	⊙ Atm			
10283.87	-2		Fe p	5.48	6.68	
10285.05	-3					
10288.950	6	3W	Si	4.90	6.10	
10291.69	-3					
10295.10	-3N		Ni			1
10295.41	-3					1
10297.10	-2					
10297.64	-2	2	⊙			
10299.32	-3					
10301.44	0	-2	Si?p	6.07	7.27	
10302.62	2	2	Ni	4.25	5.45	
10305.28	-3N					1
10306.73	-3N					
10307.46	-3N		Fe p	4.57	5.77	
10311.96	-1	-1	Fe p	2.47	3.67	
10312.55	-1	-2	⊙			
10313.15	-1	-1	⊙?			
10315.56		-2	⊙			1
10321.06	-2		Ni?	5.50	6.70	
10327.360	7	9	SrII	1.83	3.03	
10330.22	2	1	Ni	4.09	5.28	
10331.20	-2					
10331.59	-3					1
10332.36	-1		Fe p	3.62	4.81	
10333.21	-1		Fe p	4.57	5.77	
10340.900	3	6	Fe	2.19	3.38	
10343.840	8	25	Ca	2.92	4.11	
10345.17	-3		Fe?			
10347.975	3	1	Fe	5.37	6.56	
10351.11	-3					1
10353.82	2	-1W	Fe	5.37	6.56	
10362.72	-1		Fe p	5.45	6.65	
10364.05	0	-2N	Fc p	5.42	6.61	
10364.28		-2Nd?				1
10365.08	-3N					1
10366.00	-3					1
10368.52		-1N	⊙			1
10371.285	9	8W	Si	4.91	6.10	
10378.620	3	8	Ni	4.07	5.26	
10379.04	-1		Fe p	2.21	3.40	
10381.59		0	⊙			1
10388.77	-2		Fe p	5.42	6.61	
10391.14	-2					1
10392.18	-3					1
10395.795	4	8	Fe	2.17	3.35	
10396.41	-2					1
10396.81	2	10	Ti	0.84	2.03	
10397.57	-2					1
10406.98	2N	0N	⊙			
10414.89	-2					
10423.04	2	4	Fe	2.68	3.86	
10423.76	2	4	Fe	3.06	4.24	
10427.30	0		⊙			
10434.06	-1N					
10435.36	0N		Fe p	4.71	5.90	
10448.89	-2Nd?					1
10450.83	-3					1
10452.756	3	4	Fe	3.86	5.05	
10453.85	-2					1
10454.43	-2					1
10455.455	8	2	S	6.83	8.01	34
10456.753	4	ob	S	6.83	8.01	
10459.436	7	1	S	6.83	8.01	34
10460.08		2	Ti	2.25	3.43	
10465.10	-2					1
10469.680	7	9	Fe	3.87	5.05	
10486.289	3	5	Cr	3.00	4.17	
10487.30	-3					1
10496.170	3	10	Ti	0.83	2.01	
10497.64	-3					
10501.549	2	ob?	⊙			
10505.75	-2					1
10510.05	-1	1	Cr	3.00	4.17	

I A	Intensity Disk	Intensity Spot	Ident	E P or Band Data		Notes
10511.631	-1N		P	6.91	8.08	
10512.962	1					
10513.82	-3N					1
10514.68	-3					1
10515.54	-3					1
10516.20	-1					
10517.59	-2					1
10529.59	1N	ob?	P	6.92	8.10	
10530.558	2d	2	Ni	4.09	5.26	
10531.27	-3		Atm			1
10532.236	4	6	Fe	3.91	5.08	
10535.702	2N	1N	⊙			
10541.25	0N					
10542.51	-3N					1
10546.400	-2					
10551.37	-2					1
10553.02		0	Ti	2.24	3.41	
10554.95	-2					1
10555.70	0		Fe p	5.42	6.59	
10557.48	-2					1
10558.33	-2					1
10566.10		-2	Ti	2.23	3.39	
10577.151	1	3	Fe p	3.29	4.45	
10577.86	-3N					
10580.61	-3					1
10581.538	1	ob	P	6.96	8.12	
10582.155	2	-3N	Si	6.20	7.36	
10584.36	-3		Atm O_2	16–16	1, 0	7,44
10584.77	0	10	Ti	0.82	1.99	
10585.137	12	10?	Si	4.93	6.10	34
10586.13	-3					1
10587.73	-3					1
10594.37	-2					1
10596.90	-2		P	6.91	8.07	1
			Atm O_2	16–16	1, 0	
10603.426	10	8	Si	4.91	6.07	34
10605.71	-3					
10607.76		3d	Ti	0.84	2.01	
10608.43	-3		Atm O_2	16–16	1, 0	
10611.669	3	2	⊙			
10612.53	-3					1
10614.64	-3					1
10616.73	1	1	Fe p	3.25	4.42	
10619.19	-3					1
10620.07	-3		Atm O_2	16–16	1, 0	1
10620.91	0N	2N	⊙			
10622.64	-1					1
10625.07	0	0	⊙			1
10627.63	8	5	Si	5.84	7.00	
10632.23	-3		Atm O_2	16–16	1, 0	1
10633.55	-3N		Atm O_2	16–16	1, 0	1
10635.981	1	ob?	⊙			
10637.28	-3		Atm O_2	16–16	1, 0	1
10639.45	-3		Atm O_2	16–16	1, 0	1
10642.64	-3					1
10643.85	0		Atm O_2–	16–16	1, 0	1
10644.42	0		Atm O_2–	16–16	1, 0	
10646.09	-2N		Atm O_2	16–16	1, 0	1

I A	Intensity Disk	Intensity Spot	Ident	E P or Band Data		Notes
10647.65	-1	1	Cr	3.00	4.16	
10648.05	-1		Atm?			1
10650.52	-1		Atm O_2	16–16	1, 0	1
10652.37	-2		Atm O_2	16–16	1, 0	1
10656.05	-2N		Atm O_2	16–16	1, 0	1
10656.38	-2N		Atm O_2	16–16	1, 0	
10658.65	-3N		Atm O_2	16–16	1, 0	1
10660.99	10	6	Si	4.90	6.06	34
10661.63	0	10	Ti	0.81	1.97	
10667.48	2	5	Cr	3.00	4.16	
			Atm?			
10668.81	-3N		C p	7.65	8.81	1
10670.98	-3					1
10672.22	0	4	Cr	3.00	4.16	
10673.32	2ns		Atm ⊙?			
10674.09	-1		⊙			
10674.56	-3?					1
10675.45	-1		Atm O_2	16–16	1, 0	1,44
10676.47	-2N		Atm O_2	16–16	1, 0	1,44
10677.01	-1	3d	Ti	0.83	1.99	
10677.97	-1		Atm O_2	16–16	1, 0	1,44
10679.49	2					
10679.94	-2					
10680.90	-3					1
10681.46	-3		P	6.92	8.08	1
10683.09	10	2N	C	7.45	8.61	34
10684.40	0		Atm O_2	16–16	1, 0	1
10685.36	8	1N	C	7.45	8.60	34
10687.76	-3					1
10688.72	-3					1
10689.71	8	7	Si	5.93	7.08	34
10691.24	12	3N	C	7.46	8.61	
10691.84	3		Atm			
			Atm O_2	16–16	1, 0	
10694.25	8	7	Si	5.94	7.09	
10695.83	0		Atm			
10698.79	-1		Atm O_2	16–16	1, 0	
10699.52	3		Atm			
10704.08	-2					1
10705.86	-2		Atm O_2	16–16	1, 0	
10707.36	8	1N	C	7.45	8.60	29,34
10708.61	-1					1
10712.05	-1		Atm O_2	16–16	1, 0	1
10714.23	-2NN					1
10716.37	1		Atm			
10718.08	1		⊙			1
10719.90	-3		Atm O_2	16–16	1, 0	1,44
10720.81	3		Atm			
10723.04	3		Atm			
10725.20	0	-1?	Fe p	3.62	4.77	
10725.66	-3					1
10726.36		10	Ti	0.81	1.96	
10726.45	-3		⊙			
10726.79	-1		Atm			
10727.42	9	8	Si	5.96	7.11	29
10728.49	-2					
10729.588	7	0N	C	7.46	8.61	1,29

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
10730.63		-1N	⊙			1
10731.47		-2N	⊙			1
10732.81	-1N	5	Ti	0.82	1.97	
10737.57	0		Atm			1
10739.39	-2N		Atm?			1
10741.80	0N	0N	⊙			
10743.47	6		Atm			
10744.67	5		Atm			
10746.20	1	2	Atm			35
			Na?	3.18	4.33	
10749.39	12	10	Si	4.91	6.06	
10752.42	-3					1
10753.04	0	1	Fe?-	6.35	7.50	
10754.02	0	ob	C p	7.46	8.60	
10754.66	-3		Atm?			1
10760.42	-1N		Atm?			1
10761.48	2		Atm			
10762.29	-3		Ni?	4.14	5.28	1
10766.40	-3					1
10767.31	-3N	-3N	⊙			
10768.79	2		Atm			
10770.40	-3N	-3N	⊙			1
10771.74	1		Atm			
10771.96	6		Atm			
10772.86	4		Atm			
10774.85		5	Ti	0.81	1.96	
10775.49	-3					1
10779.17	2		Atm ⊙?			
10780.69	-2N	-1	Fe p	3.22	4.37	
10781.95	-1N	-1N	Atm-			
			Al?p.	4.07	5.21	
10782.49	-3					1
10783.07	1	2	Fe	3.10	4.24	
10784.57	3	2	Si	5.94	7.08	34
10785.50	-2	-3	⊙			
10786.85	7	7W	Si	4.91	6.05	
10789.48	-2N		⊙			
10791.39	-2		⊙			1
10792.17	1		Atm			
10795.15	2		Atm			
10796.11	-1	-2	Si	6.15	7.30	
10797.20	-2	-1	Atm? ⊙			
10799.58	10		Atm			
10801.32	-2	-1	Cr	3.00	4.14	
10803.69	3		Atm			
10806.43	2		Atm			
10807.38	-3					1
10809.10	0NN					
10809.32	-3					1
10810.89	7		Atm			
10811.14	5N	4N	Mg	5.92	7.06	
10812.16	0		Atm			
10814.48	-2N		Atm?			1
10816.03	1N	1	Atm ⊙?			
10816.90	-3Nd?		Cr	3.00	4.14	1
10817.68	-1		Atm			
10818.31	1	2	Fe	3.94	5.08	
10820.39		-3	Ti	3.32	4.46	
10821.64	-1N	4NN	Cr-	3.00	4.14	
10822.25	0		Atm?			
10824.0	-3		Atm			1
10827.14	12	12W	Si	4.93	6.07	
10830.38	5NN	5NN	He	19.73	20.87	53
10832.12	10		Atm			
10833.47	-3	-3	Ca-	4.86	6.00	
10834.02	5	5	Na	3.60	4.74	34
			Atm			
10834.99	-1	1	⊙			
10836.64	-3N					1
10837.60	-3		Atm?			1
10838.07	3		Atm			
10839.03	0	3N	Ca-	4.86	6.00	
10839.58	-3d?		Atm?			1
10840.14	-3		⊙			1
10840.84	3		Atm?			
10841.65		-3	⊙			1
10843.23	4		Atm			
10843.88	5	4	Si	5.84	6.98	
10845.43	-3		Atm			1
10846.80	-1N	0NN	⊙			
10849.47	3	3	Fe?	6.34	7.47	
10850.22	1		Atm			
10851.34	1		Atm			
10852.82	0		Atm			
10857.30	6		Atm			34
10858.36	-1	0	⊙			
10859.93	3		Atm			
10860.07	10		Atm			
10861.66	-3		Atm			
			Ca	4.86	5.99	
10862.67	-2		Atm			
10863.50	3	4	Atm			
			Fe	4.71	5.85	
			Ca	4.86	5.99	
10868.09	4		Atm			
10868.82	2	0	⊙			
10869.23	2	3	Atm?			
			Ca	4.86	5.99	
10869.57	4	3	Si	5.06	6.20	
10871.68	-3N					1
10872.94	-2N	-2N				
10874.93	2		Atm			34
10876.28	0		Atm			
10879.76	-3		Ca	4.86	5.99	1
10880.55	-3					1
10881.85	-2	-1?	Fe	2.83	3.97	1
10882.03	3		Atm			
10882.84	3	ob?	Si	5.96	7.09	
10884.31	1	1W	Fe	3.91	5.05	
10885.37	3	1	Si	6.15	7.29	
10886.62	-1N		⊙			1
10888.55	0		Atm			
10888.88	5		Atm			
10890.13	-1	0	Fe?p	5.29	6.42	
10891.32	-3		Ni	4.15	5.28	1
10891.77	-2	-3	⊙			

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10892.24	5		Atm			
10893.70	-3N		Si p	6.16	7.30	
10894.83	-2N					
10896.0)		0	Ti	3.34	4.47	
10896.33	2	2	Fe	3.06	4.19	
10898.75	3		Atm			
10901.00	10		Atm			
10903.70	5		Atm			
10904.92	-2					
10905.74	1	3W	Cr	3.42	4.55	
10909.20	1	2	⊙			
10910.97	-2		⊙?			1
10912.35	-3					1
10913.07	-2		⊙?			
10914.25	2	ob	MgIIp	8.83	9.96	
10914.88	5	6	SrII	1.80	2.93	
10915.35	-1		Atm			
10917.14	1N	1N	⊙?			
10921.34	-1N	-1N	⊙?			
10922.94	12		Atm			
10924.72	9		Atm			
10925.40	6		Atm			
10926.27	1Nd		Atm ⊙			57
10927.04	1N		⊙			57
10928.43	0N		⊙			57
10930.06	-3N		Cr	3.00	4.13	1
			Atm?			
10930.86	5		Atm			
10932.06	-2		Atm			
10934.06	-3		⊙			1
10935.16	6		Atm			
10938.10)	(50NN)	5NN	H	12.04	13.16	20
10938.68	2NN		Atm			
10940.12	3	4	Atm ⊙			
10942.03	0		Atm			
10942.55	3		Atm			
10944.05	1N	1W	⊙ Atm			
10944.54	4		Atm			
10946.34	10		Atm ⊙			34,40
10947.16	-2	-2				
10947.88	1		Atm			
10948.85	-3	ob	⊙			1
10949.29	-3N	ob	⊙			
10950.06	2	-2	⊙			47
10950.86	1	-1	⊙			
10951.82	0	ob	MgIIp	8.83	9.95	
10952.33	-1	-1	⊙?			
10953.36	1	3	⊙			48
10954.56	3	2	⊙ Atm?			48
10956.10	9		Atm?			
10957.15	12nl	12Nl	Atm			35
			Cr	3.00	4.13	
10957.52	-3					1
10958.55	-2					1,40
10958.94	-2					1
10959.87	9		Atm			
10960.65	-3					
10961.18	-2		Fe?p	3.03	4.16	
10962.30	3ns	4	Mg?	5.91	7.03	
			⊙			
10962.60	-3					1
10963.48	-1		⊙			
10963.92	-1	2N	⊙			
10965.03	-1		⊙			1
10965.47	5	8n	Mg?	5.91	7.03	34
			⊙			
10966.41	-3					
10967.08	-3					1
10967.95	-3					1
10968.61	-3					1
10969.36	2		Atm			
10970.08	-3					1
10970.80	-3					1
10971.28	-3					
10971.88	-3					1,40
10972.98	7		Atm			
10973.97		-1NN	⊙			1
10974.22	2		Atm			
10975.46	3		Atm			
10975.97)	6		Atm			
10976.13	6		Atm			
10976.92)	-1	1N	⊙			
10977.18	5nl		Atm			
10978.24	-2		Atm?			1
10978.77	4		Atm			
10979.34	4	1NN	Si	4.93	6.06	
10979.86	0		Atm?			
			Ni	4.14	5.26	
10980.51	-2		⊙?			
10981.16	-2		⊙?			
10982.10)	2	ob	Si	6.16	7.29	
10982.40	4		Atm			
10984.44	3dnl	3	Si	6.16	7.29	34
			Atm			
10985.86	7		Atm			
10987.02	1nl	1N	Atm-			
			Fe p	2.82	3.94	
10988.30	6		Atm			
10990.34	-2		Atm			
10990.87)	1		Atm			
10991.40	0		Atm			
10992.02	3		Atm			
10992.54	1		Atm			
10993.93	15		Atm			
10995.28	5		Atm			
10995.79	-3					1
10996.47	8		Atm			
10997.97	-1Ns		⊙			
10998.74	-2					
10999.52	4d		Atm?			40
11000.63	-2					
11001.51	-3					
11002.29	4d		Atm?			
11002.76	5		Atm			
11004.14	3		Atm			34
11005.42	-1					

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11006.08	-2		Atm?			
11006.86	9		Atm			
11007.68	10		Atm			
11008.51	-2N					1
11009.11	3		Atm			
11009.71	-2					
11010.33	-2					
11010.79	-3					
11013.25	1	-1	Fe	4.77	5.90	40
11013.74	-1		⊙			
11013.94	3		Atm			
11014.56	-3					1
11015.59	-1		Cr	3.43	4.55	
11015.92	8		Atm			
11016.72	4		Atm			
11016.96	-2					
11017.65	3		Atm			
11018.22	10		Atm			
11019.11	-3					
11019.48	-2					1
11019.90	4		Atm			
11020.48	-3					1
11020.87	3		Atm			
11021.35	-3					
11021.85	-3					1
11022.28	-3					1
11022.80	8		Atm			
11023.65	8		Atm			
11024.38	0		Atm			
11026.11	-1		Atm			
11026.85	0		⊙? Atm			
11027.62	12		Atm			
11028.74	-1N	ON	⊙			
11029.38	-3					1
11029.55	ON					1
11029.99	5		Atm			
11030.99	-3					1
11031.28	-3		Atm?			40
11031.71	-3		Atm?			1
11032.44	8		Atm			
11034.02	2		Atm			
11034.80	ON	2	⊙			
11036.93	3		Atm			34
11037.40	-3					
11038.01	-2	ON	⊙			
11038.95	12		Atm			
11040.26	6		Atm			
11041.21	9		Atm			
11041.70	9		Atm			
11042.78	1		Atm			
11044.31	-3N		⊙?			1
11045.28	4		Atm			
11045.66	4		Atm			
11046.26	3		Atm			
11046.69	3		Atm			
11047.59	-1		Atm			
11048.44	1N	3	⊙			
11049.27	0		Atm			
11050.35	1		Atm			
11050.50	0		Atm			
11050.95	0		Atm			
11051.14	0		Atm			
11052.56	10		Atm			
11052.85	5		Atm			
11053.50	5		Atm			
11054.74	4		Atm			
11055.47	-2N	-1N	(Zn)	5.77	6.89	
11056.38	4ns		Atm			
11057.41	1		Atm			
11057.85	5		Atm			
11058.43	3		Atm			
11059.29	5		Atm			
11060.03	10nl	12	Atm ⊙			
11061.09	0		Atm			
11061.68	4		Atm			
11062.36	4		Atm			
11063.24	1		Atm			
11064.13	10		Atm			
11065.15	-1		Atm			
11066.90	-2N	ON	⊙			
11068.57	-2	0	⊙			
11069.17	3		Atm			
11070.09	-2		Atm			
11070.80	3		Atm			
11071.66	4		Atm			
11072.18	0		Atm			
11072.64	-2		Atm			
11073.28	-3		Atm			1
11073.88	ON		Atm			
11074.60	7		Atm			34
11075.29	-1		Atm?			
11076.15	1	1N	⊙			
11077.10	9		Atm			
11077.89	6		Atm			
11078.63	6		Atm			
11079.50	5		Atm			
11079.93	5		Atm			
11081.65	-2N	-1N	⊙			
11082.00	12		Atm			
11082.60	2		Atm			
11083.26	-3N		⊙?			1
11084.66	15		Atm			
11085.95	ON	1N	⊙			
11087.36	-1		Atm?			
11088.48	6		Atm			
11089.20	1		Atm			
11089.62	2		Atm			
11090.65	9		Atm			
11091.30	-2					
11091.72	-2					1
11092.32	5		Atm			
11092.95	-3					
11093.54	-3					1
11093.98	0		Atm?			
11094.68	6		Atm			
11095.67	8		Atm			

I A	Intensity Disk	Spot	Ident	E P or Band Data		Notes
11096.62	-2					
11097.00	-2					
11097.53)	2		Atm			
11097.74	-2					1
11098.31	-3N					1
11098.96	4		Atm			24
11099.80	-3					1
11100.26	-1					
11101.21	-1					
11101.72	0		Atm			
11102.94	(50)		Atm			
11103.82	3		Atm			
11104.52	-2					1
11106.05	(20)		Atm			
11108.46	-3					1
11109.47	(30[illegible])		Atm			
11110.60	-3					
11111.17	2		Atm			
11112.14	(60)		Atm			13
11114.35	1		⊙			
11116.04	1		Atm?			
11117.86	4		Atm			
11118.52	1		Atm			
11119.09	4		Atm			
11119.81	1	3N	Fe	2.83	3.94	
11120.68	10		Atm			
11122.64	3		Atm			
11123.28	5		Atm			34
11124.11	4		Atm			
11125.91	-3N		⊙			1
11126.98	(40)		Atm			
11128.22	(20)		Atm			
11129.44	(40)		Atm			
11130.19	(40)		Atm			
11131.44	(20)		Atm			
11132.25	-1		⊙?			
11133.36	(20)		Atm			
11134.31	(40)		Atm			
11135.46	1		Atm			
11136.04	(25)		Atm			
11136.65	(20)		Atm			
11137.62	0		Atm?			
11139.45	5		Atm			
11139.84	3		Atm			
11140.77	4		Atm			
11143.32	6		Atm			34
11144.98	8		Atm			
11145.57	2		Atm			
11146.25	-3	1	⊙			
11148.56	(130)		Atm			13
11152.00	(60)		Atm			13
11152.66	6		Atm			
11153.33	-3	-1	⊙			
11153.92	5		Atm			
11154.56	3		Atm			
11155.35	(25)		Atm			
11157.29	(25)		Atm			34
			(Cr)	3.45	4.55	
11158.85	1					
11159.33	(20)		Atm			
11160.65	(75)		Atm			13
11162.94	(125)		Atm			13
11165.47	(100)		Atm			13
11167.09	6		Atm			
11168.03	3		Atm			
11169.73	(50)		Atm			13
11171.99	(65)		Atm			13
11173.83	-2N					
11174.44	-1		Atm?			
11175.59	2		Atm			34
11177.49	(25)		Atm			13
11178.37	3		Atm			
11180.98	(175)		Atm ⊙?			13
11183.73	0		Atm			
11184.69	-3					
11186.61	(125)		Atm			13
11189.14	(60)		Atm			13
11191.34	(125)		Atm			13
11193.19	-1		Atm			
11193.68	-1		Atm			
11194.51	1		Atm			
11194.93	2		Atm			
11196.97	(100)		Atm			13
11198.55	4		Atm			
11199.50	2		Atm?			
11201.00	(150)		Atm			13
11202.42	2		Atm			
11203.94	-3N					1
11204.95	(25)		Atm			
11206.25)	-1N		⊙			
11206.66	2		Atm			
11207.20	-3					1
11207.68	-3					1
11208.21	-2					
11210.62	(125)		Atm			13
11212.30	1N		Fe?p-	3.53	4.63	
11213.10	0		Atm			
11213.89	4		Atm			34
11216.83	(225)		Atm			13
11219.43	1		Atm			
11223.31	(350)		Atm			13
11227.52	9		Atm			34
11228.83	-1N		⊙			
11229.60	-2		⊙			
11230.17	-3N		⊙			1
11231.54	1		Atm			
11231.94	1		Atm			
11234.40	(300)		Atm			13
11238.54	-3					
11239.27	-3					
11239.9	-3N		CN?		0, 1	1,40
11240.94	(50)		Atm			
11242.15	(40)		Atm			
11242.91	-1N					1
11243.28	-2					1
11244.36	0	1	Ti-	3.17	4.26	
11245.19	4		Atm			
11245.66	0		Atm			

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
11246.13	4		Atm			
11246.95	2	3	Ti-	3.14	4.24	
11248.33	(40)		Atm			
11252.69	(325)		Atm			13
			(Al)	4.00	5.10	
11256.58	0		Atm			
11257.52	2		Atm			
11259.40	(135)		Atm			13
11260.58	8		Atm			1
11261.71	(50)		Atm			
11263.14	-3					
11264.20	3		Atm			
11265.19	(50)		Atm			
11268.19	6		Atm			34
11268.93	-2N					1
11271.14	(150)		Atm			13
11272.28	10		Atm			
11274.34	10		Atm			
11275.78	(190)		Atm			13
11277.19	8		Atm			
11278.21	-1		CN?		0, 1	
11278.73	1		CN?		0, 1	
11279.34	-1		CN?		0, 1	
11280.03	0		CN?		0, 1	
11282.16	(100)		Atm			13
11284.40	-3		CN?		0, 1	1
11285.05	0		CN?		0, 1	
11286.85	(125)		Atm			13
11290.08	(75)		Atm			13
11291.54	0		CN?		0, 1	
11294.47	(175)		Atm			13
11295.79	10		Atm			
11296.58	-1		⊙			1
11297.22	10		Atm			
11299.96	(125)		Atm			13
11301.39	5		Atm			
11301.77	5		Atm			
11302.89	1		Atm ⊙			
11304.03	-3					1
11304.61	-3					1
11305.42	(25)		Atm			
11306.52	3		Atm			
11307.25	-1					
11307.67	3		Atm			
11308.60	5		Atm			
11309.80	-3					1
11310.10	-3					1
11310.28		-2	⊙			1
11310.76	3		Atm			
11311.93	5N		⊙?			
11312.45	(75)		Atm			13
11313.29	-2					1
11313.80	-2					
11314.62	2		Atm			
11315.20	-1	ob?	⊙			
11316.06	-3					
11316.78	3		Atm			34
11318.05	(30)		Atm			

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
11319.16	1		Atm			
11319.86	1		Atm			
11321.67	(100)		Atm			13
11323.79	6ns		⊙ Atm			
11325.04	3nl		Atm ⊙			
11326.08	-1					
11326.99	(25)		Atm			
11328.09	-1N					
11329.70	(100)		Atm			13
11331.27	8		Atm			
11333.35	(175)		Atm			13
11336.18	1					
11338.56	(165)		Atm			13
11339.30	8		Atm			
11339.82	10		Atm			
11340.65	5		Atm			
11346.37	(525)		Atm			13
11349.17	(75d)		Atm			
11350.96	(25)		Atm			
11351.94	2		Atm			
11352.79	-1N		Atm?			
11353.36	-2		Atm?			1
11353.83	5		Atm			
			Fe?p	3.53	4.62	
11355.58	1N		Atm			
11357.80	(235)		Atm			13
11360.97	1		Atm			
11361.42	2		Atm			
11362.65	3		Atm			
11363.11	-1N		Atm			
11364.08	-2N		⊙			
11365.12	8		Atm			
11365.52	0		Atm			
11366.08	2		Atm			
11366.90	2		Atm			
11367.44	-2		⊙			1
11367.86	2		Atm			
11369.15	1N		⊙?			
11370.35	3		Atm			
11371.10	0		Atm			1
11371.92	(20)		Atm-			34
11373.68	(100d?)		Atm			13
			(Fe)	2.17	3.25	
11375.10	-2		S?	8.37	9.46	1
11376.38	-3					1
11377.08	-2		Fe?p	4.57	5.66	
11377.76	6		Atm			
11378.62	-2					
11379.19	3		Atm			
11380.25	-1		Atm			
11382.24	(150)		Atm			13
			(Na)	2.09	3.18	
11384.66	(25)		Atm			
11386.18	-2NN		S?-	8.37	9.46	1,40
11387.42	-2					
11388.13	-2					
11388.61	-2					
11389.41	-2					

I A	Intensity Disk	Spot	Ident	E P or Band Data		Notes
11390.14	0					
11390.82	2	4	Cr?	3.31	4.39	
			Atm			
11391.67	-3					
11392.64	-1		Fe p	5.75	6.84	
11393.12	0					
11393.65	0					40
11394.72	2					34
11395.36	1					
11396.92	(130)		Atm			13
11399.26	0					
11400.55	2					
11401.93	-2N					1
11402.41	-2					1
11402.73	0					
11403.22	-2					1
11403.80	5	20	Na	2.10	3.18	
11405.95	(185)		Atm			13
11408.35	-2					
11408.89	0		Atm			
11409.98	-2N		⊙			
11410.78)	-2					
11412.19)	(100)		Atm			13
11413.90	-3d?					1,40
11415.03	-1		⊙			
11415.66	(20)		Atm ⊙?			
11416.58	-2					
11417.16	-2		Fe?p	5.05	6.13	
11417.68)	-1					
11418.08)	-1					
11419.06	(75)		Atm			
11421.77	-3					1
11422.38	8		Fe	2.19	3.27	
11423.23	(30)		Atm			34
11424.54	0		Atm			
11425.24	-1		Atm			
11425.87	(30)		Atm			
11426.91	1		Atm			
11427.85	15		Atm			34
11428.51	-3		Fe?p	5.31	6.39	
11428.98	-2		Atm			
11430.06	-3					
11432.08	-1		Atm			
11434.79)	(60)		Atm			13
11435.49)	(15)		Atm			13
11435.87)	0N		⊙			
11436.71	0N		⊙			
11437.95	(25)		Atm			
11439.12)	10		Fe	2.83	3.91	1
11440.54)	(150)		Atm			13
11442.61)	-1					1
11446.60	(75)		Atm			13
11448.90	5N		⊙			1
11451.47	(85)		Atm			13
11453.47	2		Atm			
11454.06	-1		Atm			
11454.62	-3		Atm			
11456.26	(60)		Atm			13
11457.61	-3					
11458.25	-3					
11458.89	2n		⊙			
11460.07	(30)		Atm			34
11460.58	-1		Atm			
11462.09)	(40)		Atm			13
11463.76)	(150)		Atm			13
11467.56)	(75)		Atm			13
11468.43)	(25)		Atm			1
11468.93	-2		Atm?			1
11470.18)	(50)		Atm			13
11471.67)	(35)		Atm			13
11473.17)	(75)		Atm			13
11474.51	-3					1
11474.98	-3N					1
11475.88	2		⊙			
11476.60	-3					1
11477.32	4		Atm			34
11478.14	-1		Atm			
11478.74	-2		Atm			
11479.26	-3					
11479.79	-3		Fe?p	(5.00	6.08	
				(5.00	6.08	
11480.35	-3					1
11481.04	3		Atm			
11481.50	-1N	2	⊙			
11481.91	-3		Atm?			1,40
11482.52	-3N		Atm?			1
11483.08	(20)		Atm			
11483.85	(20)		Atm			
11484.31	10		Atm			
			Cr	3.31	4.38	
11485.50	(60)		Atm			13
11486.44	1		Atm			
11487.17	-1N		Atm			
11487.63	-3					1
11489.58	-1N	2N	⊙			
11490.08	2		Atm			
11490.97	-2		Atm			
11493.07)	(60)		Atm			13
11495.12)	(90)		Atm			13
11496.47)	10		Atm			
11497.42)	(40)		Atm			13
11498.67)	(35)		Atm			13
11500.64	-2N		Fe?p	5.00	6.08	
11501.72	(20)		Atm			34
11502.68	3N		Si	6.23	7.31	
11505.42	(50)		Atm			13
11506.73	-2		Atm			
11508.00	3N	4N	⊙			
11508.80	3		Atm			
11510.10	(60)		Atm			13
11511.63	-3					
11513.86	-3N					
11515.88	0N		Atm			
11517.26	(75)		Atm			13
11518.57	1N		Atm			
11519.47	0N		Atm ⊙?			
11521.66	-3		Atm?			1
11523.75	(125)		Atm			13

I A	Intensity Disk	Spot	Ident	E P or Band Data		Notes
11525.96	-3		Atm			1
11528.60	1		⊙			
11529.90	-3					1
11530.56	6		Atm			34
11531.37	-2d?					
11531.98	4		Atm			
11532.87	3		Atm			
11533.22	5		Atm			
11534.01	(20)		Atm			
11534.61	8		Atm			
11535.22	10		Atm			
11536.23	-3N					1
11537.41	(60)		Atm			13
11538.19	-2		Atm			1
11538.77	-2		Atm			1
11539.12	3		Atm			
11539.54	0		Atm			
11540.01	(20)		Atm			
11540.77	3					
11541.63	(50)		Atm			13
11542.92	-1		Fe?p	5.32	6.39	
11543.91	0		Atm			
11545.17	-3N					
11546.77	(40)		Atm			13
11547.88	1N		Atm			
11548.91	-1N		Atm			
11550.41	-3					
11551.08	(20)		Atm			13
11551.79	-1		Atm			
11552.28	-3		⊙			1
11553.03	0		⊙?			
11554.65	(75)		Atm			13
11556.10	-3		⊙?			52
11556.92	-1N		⊙?			52
11557.08	-1N		⊙?			52
11557.43	-3N		⊙?			1,52
11558.09	-1N		⊙?			52
11559.00	-1Nd?		⊙?			52
11560.42	-3N		⊙?			52
11560.98	4		⊙?			
11562.05	(50)		Atm			13
11562.90	-2d		⊙?			52
11563.69	0N		⊙?			52
11564.58	-3N		⊙?			1,52
11565.50	4d		Atm ⊙			34
11566.49	-3					1
11567.87	-3					
11569.13	(25)		Atm			
11569.96	0		⊙?			
11571.09	4		Atm			
11571.51	5		Atm			
11572.57	0		Cr?p	3.11	4.17	
11573.04	-3		CN?		1, 2	40
11573.25	-3		Fe?p	5.61	6.67	
11573.79	3		Atm			
11575.20	(50)		Atm			13
11576.26	15		Atm			
11577.42	-3N		⊙			1
11578.46	-2					1
11579.75	-2		Atm			
11580.52	5		Atm			34
11581.85	(20)		Atm			
11586.67	(50)		Atm			13
11588.27	4		Atm			
11590.38	2		Atm			
11591.41	0N		Si	6.24	7.31	
11592.21	3N		Atm			
			Si?	6.24	7.31	
11593.65	0N		Fe	2.21	3.28	1
11594.04	(35)		Atm			13
11594.70	1N		Atm			
11596.10	-1		⊙			52
11597.99	15		Atm			
11598.81	-3N					1
11600.21	(35)		Atm			13
11601.05	(40)		Atm			13
11602.08	-2		C?p	8.60	9.67	
11602.88	-3		Fe p	5.25	6.31	1
11603.53	-3N					
11604.40	10		Atm			
11605.31	7		Atm ⊙			
11606.49	0		Atm			
11607.59	4		Fe	2.19	3.25	
11608.77	-3					1
11609.38	10nl		Atm			
			Si p	6.23	7.30	
11609.91	-1					1
11610.56	1		Cr	3.31	4.37	
11611.44	15ns		Si-	6.23	7.30	
			Atm			
11612.49	2		Atm			
11613.84	10		Atm			34
11614.38	-3					
11615.80	-2NN		⊙			
11617.26	4		Atm			
11618.04	-2					
11618.60	3		Atm			
11619.33	-1N		C?	8.61	9.67	
11620.24	(35)		Atm			13
11620.88	-3					1
11622.07	10		Atm			
11623.06	0N		Atm			
			Cr?p	3.08	4.14	
11624.76	-1N		Atm ⊙			
11626.52	-3					1
11627.57	-3					
11628.92	2		⊙ Atm			
11629.84	-2N		⊙?			
11630.50	1N		C?p	8.61	9.67	
11631.63	-3					1
11632.66	10		Atm			
11633.08	10		Atm			
11633.09	(20)		Atm			
11637.04	-3NN					1
11638.22	10		Fe	2.17	3.23	34
			Atm?			
11639.25	-3Nd?					
11639.80	-2		Atm			

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
11640.55	2		Si	6.25	7.31	
			Atm			
11640.97	0		⊙			
11641.84	-3d?		Fe?p	4.56	5.62	
11642.41	2		Atm			
11643.12	-3					1
11643.80	0		Atm			
11644.25	-3					1
11644.74	-3d?					
11645.33	0N		⊙			
11646.30	10d		Atm ⊙			
11647.36	5		Atm			
11648.06	-3					1
11649.09	10		Atm			
11649.75	10		Atm			
11650.88	-1					
11653.18	-2NN		C	8.73	9.79	
11654.44	10		Atm			
11655.00	6		Atm			
11655.53	10		Atm			
11656.56	0N		Atm?			
			N?	10.88	11.94	
11657.53	10		Atm			
11659.08	0N		C	8.73	9.79	
			Fe p	5.00	6.06	
11659.70	0		⊙?			
11660.92	-2N		⊙?			
11661.83	7		Atm			34
11662.95	-3N		⊙?			
11664.35	(30)		Atm			13
			(C?)	8.61	9.67	
11665.78	0N		Atm ⊙			
11666.2	-3N					1
11666.87	-3					1
11667.36	3		Atm			
11667.98	-3					
11668.75	10		Atm ⊙?			
11669.70	0N		Atm			
			C	8.73	9.79	
			Fe p	4.54	5.60	
11670.61	-3					1
11671.33	-1		Atm?			
11671.80	-2		Atm?			
			Cr?p	3.10	4.16	
11672.85	-1		Atm?			
11673.47	-3					1
11674.11	7		Atm			
11674.80	5		Atm			
11675.43	-3					
11676.40	2Nd		Atm			
			Fe p	4.93	5.99	
11679.56	-1		Atm			
11680.40	5		⊙? Atm			
11680.94	7		Atm			
11681.77	4N		Atm			
11682.23	-3N					1
11683.07	-1N					
11684.00	-3					
11685.15	4		Atm			

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
11685.89	1		⊙?			
11687.82	-3N					1
11688.36	-3		Fe?p	3.53	4.59	
11689.05	-3					1
11689.54	2		Atm			
11690.01	1		Fe	2.21	3.27	
			(K)	1.60	2.66	
11690.42	5		Atm			
11691.13	-3					1
11691.90	8		Atm			34
11694.14	-3					1
11695.80	-3N					
11696.96	0		Atm			
11698.91	1ns		Atm			
11699.80	2		Atm			
11700.38	2n		Atm?			
11700.95	2		Atm			
11701.76	-3					1
11702.54	7		Atm			
11703.32	-1		⊙? Atm			
11705.13	0		Atm			
11707.45	15		Atm			
11710.18	-3N					
11711.15	-2Nd					
11714.61	0N1		Atm			
11715.71	8d		Atm ⊙?			
11717.39	-2N					
11720.42	(20)		Atm			34
11722.75	-3N					
11724.12	-1N		Atm?			
11725.43	-3					1
11725.86	4		Atm			
11727.09	-2					1
11727.76	-1					
11728.48	-2		Fe p	4.99	6.04	1
11729.02	4		Atm			
11731.59	-3					
11732.34	-1N		Fe?p	3.03	4.09	
11732.89	1		Atm			
11733.29	4		Atm			
11734.05	-3					1
11735.29	0N					
11736.01	15		Atm			
11736.72	1		Atm			
11737.34	12		Atm ⊙?			
11738.97	15		Atm			
11739.72	-3					1
11740.12	4		Atm			1
11742.80	-2NN		⊙			1
11744.78	-1N		⊙			1
11746.09	0N		⊙ Atm			
11748.28	1N		C	8.60	9.65	
11749.32	-3		Atm			
11750.04	5		Atm			34
11751.21	6		Atm			
11752.23	4		Atm			
11753.42	5N		C	8.61	9.66	
11754.84	5N		C	8.61	9.66	11
			Atm			

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
11759.63	-3		Atm			
11763.45	2ns		Atm ⊙?			
11768.37	0		Atm			
11769.72	-2N		K	1.61	2.66	
11771.17	6		Atm			
11771.92	-3					
11772.77	15		Atm			
			(K)	1.61	2.66	
11773.45	-2		Atm ⊙?			
11774.37	(20)		Atm			34
11775.60	6		Atm			
11777.61	0NN		C p	8.61	9.65	
11780.84	15		Atm			
11783.36	5		Atm			
			(Fe)	2.82	3.87	
11792.53	20		Atm			
11794.92	8		Atm			
11795.78	-3					38
11797.55	0		Ti	1.42	2.47	
11801.10	0		C	8.61	9.66	
11804.12	-2N					1
11804.93	-1					
11805.71	-1		Atm			1
11806.08	0		Atm			1
11808.41	-3					
11810.19	8					34
11811.12	-3					
11811.87	-3N					1
11812.76	1					
11815.05	(60)		Atm			13
11815.62						
11816.95	-2					
11817.18	-3					1
11817.96	2		Atm			
11818.80	(35)		Atm			13
11822.52	1		Atm			
11822.91	0N		⊙			1
11823.77	3		Atm			
11825.00	-2		Atm			
11828.20	5NN		Mg	4.33	5.37	11,63
11828.24	6		Atm			
11833.13	2		Atm			
11834.33	-3N					
11835.44	4		Atm			
11839.00	2N		⊙			
			(Fe?p)	5.59	6.63	
11840.06	(25)		Atm			
11841.77	-2		Atm			
11843.24	-2		Atm			
11844.73	10		Atm			
11846.16	0		Atm			
11847.30	15		Atm			
11848.79	-1N		C	8.61	9.65	
11851.51	0		Atm			
11854.02	-2N		Atm			
11856.22	2		Atm			
11861.73	8		Atm			
11862.99	-2		C	8.61	9.64	
11864.14	-1NN		⊙?			1
11865.76	8		Atm			
11868.03	-1		Atm?			
11868.82	-3		Atm?			
11870.02	-2					
11871.49	-2					1
11872.34	2					
11873.52	(30)		Atm			13
11876.24	0		Atm			11
11876.32	10NN		⊙			11
11876.86	-1		Atm			11
11878.70	(25)		Atm			13
11879.66	-2N		C?	8.60	9.64	1
11880.90	4					
11882.02	5					
11882.87	4		Atm			
			Fe	2.19	3.23	
11884.13	2		Atm			
			Fe	2.21	3.25	
11886.24	-2N		⊙? Atm			
11889.08	12		Atm			
11890.48	-1		Si p	5.06	6.10	
11892.90	0N		C	8.61	9.64	
11895.02	-2		Atm?			
11895.88	1N		C	8.61	9.65	
11897.22	-2N		⊙			
11899.64	12		Atm			34
11903.17	1n		Atm ⊙?			1
11904.82	2		Atm			1
11906.82	1N		⊙?			
11908.04	2		Atm			
11909.97	1nl		Atm			
11915.39	5		Atm			34
11916.25	-2		⊙?			1
11916.85	-1N		⊙?			1
11918.02	0N		⊙?			1
11923.03	1N		CN?		2, 3	40
11924.74	1		Atm?			
11928.98	1N		⊙?			
11931.61	(20)		Atm			
11933.57	2		Atm?			
11938.41	-2N		⊙?			1
11941.32	1		Atm			
11942.44	1		Atm			
11943.90	0n		⊙?			1
11947.59	1		Atm			
11948.07	1		Atm			
11949.77	1n		Ti	1.44	2.47	
11951.72	0n		⊙?			
11952.74	5		Atm			
11954.47	0		⊙?			
11955.31	1		Atm			
11960.23	5		Atm			
11961.93	0		Atm			
11966.30	0		Atm			
11969.30	-1		Atm			1
11972.86	(25d)		Atm			
			(Fe)	2.17	3.20	
11981.86	2		Atm			
11982.97	0N		⊙?			

I A	Intensity Disk	Spot	Ident	E P or Band Data		Notes
11984.50	10Ns		Si-	4.91	5.94	
			Atm?			
11986.75	3		Atm?			
11988.20	0		⊙			
11988.80	5		Atm			
11991.63	4n		Si	4.90	5.93	
11994.00	4n		Fe p	4.89	5.92	
11998.40	3		Atm?			
12001.41	2		Atm?			
12005.31	5		Atm			
12007.75	0NN		⊙?			
12010.20	5		Atm			
12011.24	0nl		⊙?			1
12015.10	5		Atm			34
12015.73	3		Atm			34
12023.06	3		Atm			
12027.32	0		⊙?			
12030.13	0		⊙?			
12031.56	10nl		Si	4.93	5.96	
12034.10	15		Atm			
12035.01	15		Atm			
12036.84	5		Atm			
12037.98	0					1
12039.88	0					
12041.44	0N					1
12043.04	0					1
12047.37	10		Atm			34
12052.08	1					1
12053.17	-1		Fe p	4.54	5.56	1
12056.80	1					1
12060.11	-1					1
12061.92	6		Atm			
12063.83	-1					1
12067.24	6		Atm			
12069.16	0N		⊙?			1
12071.19	8nl		Atm ⊙?			
12075.57	-1NN		-Fe p	5.75	6.77	1
12078.05	6		Atm			34
12078.69	6		Atm			
12080.27	-1					1
12082.04	3		Atm?			
12083.79	8N		Mg	5.73	6.75	
12088.32	10		Atm			34
12090.96	-1		Atm			1
12092.16	-2					1
12096.41	8		Atm			34
12101.75	-2		Atm?			1
12102.46	-1		⊙?			1
12103.62	4		Si	4.91	5.93	34
12106.20	-1N		⊙			1
12107.40	3		Atm			
12109.33	2		Atm			
12110.25	8		Atm			1,33
12110.61	7		Atm			1,33
12113.17	0		Atm?			
12113.77	1		Atm?			
12115.51	-1					1
12115.99	6		Atm			
12117.19	-1		Atm?			1
12118.90	-1		Atm?			1
12119.86	5		Atm			
12120.79	7		Atm			
12122.74	0		Atm			
12123.66	0		Atm			
12126.48	-2		Atm			
12127.28	5		Atm			
12129.44	0NN		⊙?			1
12134.55	4		Atm			40
12135.54	2		Atm			33
12135.95	0					33
12137.22	2		Atm			
12138.13	6		Atm			
12140.73	6		Atm			
12142.67	4		Atm			
12144.98	3N		⊙			
12145.90	8		Atm			
12146.96	-1		Atm			1
12148.62	3		Atm			
12151.35	8		Atm			
12159.15	2		Atm			1
12160.14	0		⊙?			1
12160.95	2		Atm			1
12163.26	3d					1
12164.64	-1n		⊙?			1
12165.29	8		Atm			34
12166.99	2		Atm?			1
12169.16	-2NN		⊙			1
12173.76	1		Atm			1
12176.18	7		Atm			
12177.92	3		Atm			1
12178.35	3		Atm			1
12184.42	-2		Atm?			1
12185.87	4		Atm			1
12188.02	6		Atm			1
12189.39	-1N					1
12190.42	7d		Atm			1
12195.67	4		Atm			1
12200.09	8		Atm			
12203.51	0		Atm			1
12210.64	1		Atm			1
12211.10	3		Atm			1
12211.87	4		Atm			1
12214.56	10		Atm			
12218.90	-1		Atm			1,33
12221.45	-1		Atm			1,33
12223.14	10		Atm			34
12227.06	0		Fe p	4.59	5.60	1
12227.76	3		Atm			1
12232.79	6					1
12234.35	6					
12239.53	5		Fe?p	5.00	6.01	1
12241.70	1		Atm			1
12241.94	1nl		⊙?			1,40
12245.12	-1NN		Fe?p-	3.62	4.63	1
12246.90	2		Atm			1
12247.35	-1		Atm			1,33
12249.85	1					1
12251.02	5		Atm			

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
12257.47	3		Atm			1
12258.74	0N					1
12260.37	-1NN					1
12263.84	3		Atm			1
12267.23	8		Atm			34
12267.95	-1		Fe p	3.26	4.27	1
12270.16	1		Atm			1
12270.76	8nl		Atm?			
			Si	4.93	5.94	34
12272.42	4		Atm			1
12275.27	-1					1
12276.49	2		Atm			1
12281.09	-1n					1
12283.61	-2					1
12284.90	2		Atm			1
12286.01	3		Atm			1
12292.08	5		Atm			
12295.33	-1NN					1
12297.60	2		Atm			1
12297.85	1NN		⊙			1
12300.32	1NN		⊙			1
12305.91	-1		Atm			1
12309.17	0		Atm?			
12314.36	-2N		⊙?			1
12314.84	1		Atm			
12320.23	-1N		⊙?			1
12323.09	1		Atm			
12323.78	-2					
12324.97	2		Atm			
12327.47	1		Atm			
12328.97	0N		⊙			1
12329.69	-2					1
12330.70	4		Atm			
12340.89	-2N		-Fe p	2.27	3.27	1
12341.73	-2					1
12343.06	-1		Fe p	4.62	5.62	
12345.41	-2N					1
12347.94	-2		Atm			1
12349.87	1N		⊙?			1
12351.92	-2		Atm			1
12354.90	-1		Atm			1
12357.07	-2					1
12358.10	-2					1
12363.97	2		Atm			
12366.08	-1		Atm			
12368.64	1		Atm			
12377.34	-2N					1
12382.84	-1N					1
12390.24	2		Atm			
12392.83	-1N		⊙?			1
12395.88	2		Atm			
			(Si p)	4.93	5.93	
12398.65	-2N					1
12400.28	-1					1
12401.65	-1					1
12403.41	2		Atm			
12406.89	-1		Atm			1
12413.75	-2N		⊙?			1
12417.97	-1		Atm			
12423.00	2		Atm			
12423.36	-2N		Ca?p	4.72	5.72	1
12432.25	-1		Atm			
12433.43	3		Atm			
12437.59	-1N					1
12439.77	1Nl		Atm ⊙			
12442.46	0		Atm?			1
12452.41	-1NN		⊙?			1
12457.13	-1		Atm			1
12458.59	-2					1,40
12460.98	-1N					1
12481.93	-1N					1
12492.65	0		Atm O_2	16-16	0, 0	1,45
12504.92	-1N					1
12507.74	1		Atm O_2	16-16	0, 0	
12522.16	3ns		K?	1.61	2.60	
			C?	8.73	9.72	
12523.07	3		Atm O_2	16-16	0, 0	
12525.23	-2					1
12532.98	1N					1
12535.19	0N					1
12538.73	5		Atm O_2	16-16	0, 0	
12549.50	1N		C	8.81	9.79	
12551.07	-1N					1,40
12554.70	6		Atm O_2	16-16	0, 0	
12557.11	0n		Fe p	2.27	3.25	
12562.25	6N		C?	8.81	9.79	
12566.40	-2N					1
12569.06	1N		C	8.81	9.79	
12571.02	8		Atm O_2	16-16	0, 0	
12581.68	5ns		-C	8.81	9.79	
12583.09	-2		⊙?			1
12583.97	1		Atm			
12586.69	-2		Fe?p	5.25	6.23	1
12587.59	8		Atm O_2	16-16	0, 0	
12588.92	-1		Fe?p	5.00	5.98	1
12592.42	-1		⊙ Atm			1
12594.95	2		Atm O_2	16-16	0, 0	1
12598.40	2		Atm O_2	16-16	0, 0	1
12601.33	2		Atm O_2	16-16	0, 0	1,26
12601.60	2N		C	8.81	9.79	1
12604.60	10		Atm O_2	16-16	0, 0	26,34
12605.67	-2					1
12607.93	4		Atm O_2	16-16	0, 0	1
12611.32	5		Atm O_2	16-16	0, 0	1
12614.20	4N		C	8.81	9.79	
12614.84	5		Atm O_2	16-16	0, 0	
12615.98	-1		Fe p	4.62	5.60	1
12616.96	-2		Atm?-			1
			Fe?p	3.29	4.26	
12618.16	6		Atm O_2	16-16	0, 0	26
12621.87	12		Atm O_2	16-16	0, 0	26,34
12623.05	-1		Atm			1
12624.45	-2n					1
12625.33	7		Atm O_2	16-16	0, 0	
12626.66	-2					1
12627.76	-2					1
12628.35	-2					1
12629.45	7		Atm O_2	16-16	0, 0	

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
12630.53	-2					1
12631.45	-2		Fe p	5.42	6.40	1
12632.72	8		Atm O_2	16-16	0, 0	
12633.29	-2					1
12635.36	3NN		⊙			1
12636.62	-2					1
12637.19	8		Atm O_2	16-16	0, 0	
12638.76	0		Fe p	4.54	5.52	
12639.38	2		Atm O_2	16-16	0, 0	1
12640.45	8		Atm O_2	16-16	0, 0	
12645.21	8		Atm O_2	16-16	0, 0	
12648.41	8		Atm O_2	16-16	0, 0	
12648.74	1NN		-Fe p	4.59	5.56	1
12653.50	8		Atm O_2	16-16	0, 0	
12656.69	9		Atm O_2	16-16	0, 0	34
12657.30	3		Atm O_2	16-16	0, 0	1
12658.94	-1NN		⊙			1
12662.03	8		Atm O_2	16-16	0, 0	
12664.46	-2		Atm			1
12665.19	10		Atm O_2	16-16	0, 0	
12667.06	-2N		⊙?			1
12670.98	1		Atm O_2	16-16	0, 0	
12671.57	-1		Atm			
12673.99	10		Atm O_2	16-16	0, 0	
12674.47	-2		Atm?			1
12679.19	1N		Na	3.60	4.57	1
12680.13	2		Atm O_2	16-16	0, 0	45
12680.80	4		Atm O_2	16-16	0, 0	
12681.65	5		Atm O_2	16-16	0, 0	
12682.74	5		Atm O_2	16-16	0, 0	
12683.46	1		Atm O_2	16-16	0, 0	
12684.10	6d		Atm O_2	16-16	0, 0	
12684.81	3		Atm O_2	16-16	0, 0	
12685.54	-1					1
12685.88	3		Atm O_2	16-16	0, 0	
12687.24	3		Atm O_2	16-16	0, 0	26
12687.69	-1					
12688.83	3		Atm O_2	16-16	0, 0	
12689.40	-2					1
12689.89	-2					1
12690.68	3		Atm O_2	16-16	0, 0	
12691.85	-2					1
12692.22	-2					1
12692.82	2		Atm O_2	16-16	0, 0	
12693.68	1		Atm			
12694.35	-2					1
12695.16	2d?		Atm			1
12697.06	-1		Atm			
12697.87	0		Atm			
12700.74	-1		Atm			1
12703.59	5		Atm O_2	16-16	0, 0	26
12704.10	-1n					1
12706.86	2		Atm O_2	16-16	0, 0	1
12707.49	-2					1
12709.87	2					
12713.61	6		Atm O_2	16-16	0, 0	
12714.43	-2					1
12715.26	-2		Fe?p	5.80	6.77	1
12716.89	4		Atm O_2	16-16	0, 0	
12718.88	-2					1
12719.35	-2					1
12720.62	-2					1
12722.05	-1					
12723.96	6		Atm O_2	16-16	0, 0	26,34
12725.38	-2					1
12726.47	-2					1
12727.10	5		Atm O_2	16-16	0, 0	
12729.60	-2					1
12730.26	-2					1
12731.90	-2					1
12733.25	-1					1
12734.48	6		Atm O_2	16-16	0, 0	
12735.58	-2					1
12736.83	-2					1
12737.62	5		Atm O_2	16-16	0, 0	26,34
12739.08	-2					1
12739.98	-2					1
12741.19	2d?					
12741.94	-2					1
12745.36	3		Atm O_2	16-16	0, 0	
12748.45	3		Atm O_2	16-16	0, 0	
12749.84	-2					1
12750.60	-2					1
12751.74	-2					1
12754.55	-2					1
12756.50	3		Atm O_2	16-16	0, 0	
12759.44	2		Atm O_2	16-16	0, 0	
12760.73	2					1
12767.56	8d?		Atm O_2-	16-16	0, 0	
12768.48	-2					1
12769.28	-2					1
12770.03	-2					1
12770.79	2		Atm O_2	16-16	0, 0	1
12776.00	-2					1
12779.41	0		Atm O_2	16-16	0, 0	
12780.59	0		Atm			
12781.28	-2					1
12782.34	-1		Atm O_2	16-16	0, 0	
12788.16	-2					1
12789.42	3					1
12791.25	-2					1
12793.14	-2		Fe p	3.24	4.20	1
12794.02	-2					1
12795.70	-1					
12796.36	-2					1
12799.09	-2					1
12800.06	-2					1
12800.82	0					1
12803.64	-2					1
12804.30	-2					1
12804.96	2					1
12806.50	-1					1
12807.48	-1		Fe p	3.62	4.59	1
12813.90	-2					1
12814.64	-2					1
12816.11	-1		Ca?	3.89	4.86	1
12818.23	(20)		H	12.04	13.00	20,34
12821.36	0		Atm			1

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
12823.48	-1		Atm			1
12842.71	-1		Atm			1
12869.04	-1		Atm			1
12878.91	10		Atm			1
12885.54	4		Atm			1
12890.21	0					1
12897.12	0		Fe?p	5.29	6.25	1
12899.75	12					
12913.76	5					1
12917.04	5N		(Fe?p)	3.29	4.24	1
12923.08	3					1
12934.94	3					1
12937.75	0					1
12944.83	0					1
12946.60	1		Fe p	3.24	4.19	1
12951.68	5					1
12953.74	10					1
12955.82	3					1
12958.77	2					1
12963.36	1					1
12965.24	1					1
12966.19	0					1
12969.96	10					
12971.72	3					1
12976.45	3					1
12979.75	2					1
12992.27	5					
12994.15	1		⊙?			1,62
13000.79	4					
13003.53	1		⊙?			1
13007.11	4		Fe?p-	2.98	3.93	
13020.01	2		⊙?			1
13024.65	4		⊙?			
13031.80	4		⊙?			
13036.64	2					
13039.45	5nl					
13052.31	3		(Zn)	6.63	7.57	
13062.90	6					
13065.44	3		⊙?			1
13067.64	3nl		⊙?			1
13077.73	10					
13093.04	6					
13095.96	5					
13101.92	10nl					
13119.06	4		⊙?			
13123.20	3		Al	3.13	4.07	
13126.09	4		⊙?			
13128.38	0d					1
13133.50	15					
13138.91	3					1
13142.23	1					1
13144.99	5		⊙?			
13150.35	4		Al	3.13	4.07	
			(Zn)	6.63	7.56	
13153.09	3		Si?p-	4.90	5.84	1
13166.41	15		(C)	8.73	9.67	34
13179.76	4					1
13184.84	4					
13190.50	5					

I A	Intensity Disk	Spot	Ident	E P or Band	Data	Notes
13197.35	6		(Zn)	6.63	7.56	
13200.56	3		⊙?			
13210.79	5					
13218.05	1					1
13225.94	2		⊙?			1
13228.50	4					
13230.82	1		⊙?			1
13233.92	-1		⊙?			1
13237.05	4					1
13239.88	2		⊙?			1
13249.96	1		⊙?			1
13252.57	1		⊙?			1
13255.70	1		⊙?			1
13259.93	2nl					1
13266.26	1		⊙?			1
13268.08	3					1
13275.21	1		⊙?			1
13280.43	6					1
13284.58	5					1
13288.77	5		(Fe?p)-	2.94	3.86	
			(Si?p)	4.91	5.84	
13293.34	0					1
13297.69	4					34
13305.31	0		⊙?			1
13310.41	7					1
13316.01	6					1
13321.20	4					
13327.41	0		⊙?			1
13332.69	10		(Ti p)	2.24	3.17	1
13338.96	ON					1
13343.27	0					1
13345.91	4					1
13350.63	ON					1
13352.91	-2					1
13354.48	ON					1
13356.39	15					34
13363.84	-1N					1
13367.51	1					1
13371.42	3					1
13376.33	5					
13384.35	2N		Fe?p-	3.00	3.93	1
13389.76	2		Fe?p	3.00	3.93	1
13398.32	4N					1
13401.95	4d					1
13409.92	1					1
13413.06	1					1
13418.48	-1nl		⊙?			1
13423.78	2		⊙?			1
13426.96	1		⊙?			1
13435.32	1					1
13437.72	3					1
13442.12	2					1
13452.08	2N					1
13455.94	0					1
13459.46	-1N					1
13462.21	1N					1
13468.41	0					1
13473.91	3					1
13495.20	2		Fe p	4.93	5.85	1

Notes to Table A

1 The accuracy of this wave length is impaired by faintness or diffuse character of the line, or, in some cases, by the use of a scale and hand magnifier in place of the usual measuring machine.

2 These two lines were published by Rowland as one.

3 Clerical or typographical error of ±0.1A in Rowland's wave length is suspected.

4 λ7330.859 is the last line in Rowland's Table.

5 λ7016.62 is probably a real solar line, although it is clearly present only on a few consecutive exposures on a very dry day. Its absence on numerous superior plates at greater humidity may perhaps be explained by variation in the width of near-by strong atmospheric absorption or by some cause related to the phenomenon mentioned in note 11, but doubt remains as to its own constancy. λ7244.48 also indicates possible variability of intensity. See note 56.

6 The atmospheric line λ7290.415 has an unresolved companion on the shortward side which is due to *Si*. The Atlas confirms the presence of the solar component. Sunspot spectrograms, especially when made at low humidity, show a weakening of the blend due to suppression of *Si*. The intensity of this *Si* line in the disk is probably less than 3.

7 At λ10584 a weak emission line superposed on the continuous background of the solar spectrum was for a time suspected. Tests with a microphotometer showed the density to be the same as for the adjacent background. Faint variable absorption near by (see note 44) may have contributed to the erroneous impression.

8 Peculiar line, see remarks as follows:

λ6638.076. Diffuse, probably a single line; possibly corresponds to a weak sharp chromospheric emission line.

λ6719.62. Very diffuse, especially longward.

λλ6743.575, 6748.779, 6757.195. These lines of *S* I are somewhat more diffuse than those in the multiplet near λ7679.

λ6835.368. Very diffuse and wide.

9 λλ7108.92, 7852.71, 8090.464, and a few other lines, mostly of *Ti*, appear to be bordered on one or both edges by very weak emission. The effect is more definite at the solar limb and in sunspots than on the normal disk, but the best plates persistently show it even at the center. This observation is quite distinct from that mentioned in note 7. A solar band head, probably due to *ZrO*, lies near the longward side of λ7108.92.

10 Like many other lines, λ7068.423 is not describable within the limits of Table A. It is discussed here in detail to illustrate the inadequacy of tabular descriptions. The disk intensity for this line, estimated in the usual way, was 7, deviating abnormally from the tabular 4, which was derived from the Atlas as explained in the text. The first supposition in such a case is that the line is a blend of solar and atmospheric components, but critical tests (comparison of spectra from east and west limbs and from high sun and low sun) gave no evidence of an atmospheric component. The deviation of the eye estimate may relate to difficulties in maintaining the reference scale of intensities when results from the 75-foot and 21-foot instruments are combined, as in this region. Visual judgment may perhaps be influenced by the variations of intermingled atmospheric lines, which are troublesome here. There is no reason to question the tabular disk intensity, which we derive from the Atlas.

Examination of several spectrograms showed no change of intensity for this line from disk to spot, in good agreement with table 9 for the E P, 4.06 volts, of λ7068.423. But on an excellent high-dispersion plate from a large spot nearly central on the disk a different result is obtained. Here, because of the particularly favorable circumstances of observation, a more significant comparison of umbra, penumbra, and disk can be made than is ordinarily possible: in the penumbra the line here shows little change from the disk, but in the umbra it is nearly obliterated.

The well known technical difficulty of isolating the typical umbral spectrum doubtless affects a large part of the observational data on spots. Many spectrograms, though photographically excellent, are more representative of the penumbra than of the umbra, a fact which, by itself, helps to fix the norm with which the behavior of individual lines is compared.

Two further considerations contribute to a rational explanation of the apparent contradictions in the observations on λ7068.423. A normal Zeeman triplet, viewed without analyzer, parallel to the field, shows two equal components, each having one-half the central absorption of the no-field line. λ7068.423 has, in the disk, a central absorption equal to about 40 per cent of the continuous background. If it were

a normal triplet its two n-components would each have central absorption of only 20 per cent, but this line has fourteen n-components of various intensities, not resolved in any spot field. Obviously, the strong field typical of a large umbra will make such a line appear to weaken, regardless of its true thermal behavior. In the penumbra or in the integrated light of a less favorable spot, the resultant field is much weaker, the magnetic components are more completely superposed, and the temperature effect is not masked. Such effects of magnetic splitting are exaggerated in the infrared, according to Preston's rule.

An additional factor in the observation of λ7068.423 is the rich background of sharp molecular lines occurring in this region of the umbral spectrum, chiefly from *TiO*. As we point out in note 11, a diffuse absorption line may appear to be suppressed by a nearly coincident sharp line.

At the solar limb λ7068.423 is weakened, while its companion, λ7068.64, is strengthened, the ratio of their intensities being reversed as compared with the normal disk spectrum. On our best chromospheric plates both lines appear in absorption.

Other lines present special problems which cannot be indicated in Table A except through notes. We discuss λ7068.423 at length because it illustrates the kind of difficulties of interpretation that often arise, but it is necessary to omit much detail of this nature in preparing so large a table. See note 59.

11 Solar lines λλ6920.168, 6922.243, 6953.057, and 7755.36 are measured only on plates made at high sun, where they appear single and normal. In each case an atmospheric line is nearly coincident but is seen only at low sun, being then blacker and narrower than the solar line. Obviously a resolving power of about 400,000 would be required to show as doubles the close pairs written in Table A, if both their components had been sharp and simultaneously visible. We have not used such resolving power. λλ6953.057 and 7755.36 are almost completely suppressed by the superposed narrower atmospheric lines at low sun.

The *Ni* line λ6955.040 is closely similar to *Fe* λ6960.330 except at solar zenith distances of 85° or more. The *Ni* line is then distinctly weaker than the *Fe* line. For λ11754.84 only the dry, high-sun measurement is given. The strong diffuse solar line λ11876.32, measured at low humidity, is often apparently suppressed by the adjacent atmospheric lines. The pair λλ11828.20, 11828.24 are difficult to measure and to interpret. Both solar and atmospheric absorption are involved. See notes 63, 31.

12 The spectrum of an incandescent filament, when observed through only a few meters of air under ordinary laboratory conditions, shows sharp black absorption lines, due to water vapor and to oxygen, corresponding to the strongest features of the great telluric bands in the solar spectrum. Such absorption lines can cause trouble, when emission spectra are studied in the laboratory, by reducing the intensity and shifting the observed maxima of nearly coincident emission lines. The principal water vapor lines between λ9118 and λ9581, as observed with a 21-foot grating and 40 feet of air, are given below in table B. Obviously, such lines as these, and especially those of greater strength at longer wave lengths, can be troublesome in the observation of spectra in the laboratory. For example, six of the lines in table B fall within 0.1A of laboratory wave lengths of emission lines. Apparent positions and intensities of the latter will depend in varying degree on the absolute amount of water vapor in the light-path from source to photographic plate.

TABLE B (note 12)

λ	λ	λ
9118.85	9364.920	9443.351
9155.63	9366.420	9456.207
9176.82	9369.409	9460.048
9303.855	9371.517	9461.345
9316.866	9377.731	9480.330
9319.062	9381.189	9481.731
9325.457	9386.805	9500.960
9333.631	9410.445	9501.717
9339.410	9421.836	9516.996
9342.685	9426.927	9519.441
9343.568	9428.282	9522.326
9344.193	9430.655	9544.008
9345.538	9437.783	9553.444
9354.329	9440.727	9557.317
9358.753	9441.123	9565.057
		9581.087

13 For the strongest atmospheric lines and close groups, intensities and wave lengths are very difficult to determine from observations of the solar spectrum. For such lines and groups, intensities have been assigned roughly proportionate to the approximate width at medium humidity, and placed in parentheses. For example, an intensity written (50) corresponds to a width of about 1A, and (20), the weakest included in this notation, has a width of 0.4A. In table C rough positions are given for the limits within which most of the strongest "lines" occur. It is hoped that these numbers may be useful

indicators of the portions of solar and stellar spectra which are generally obscured at a dispersion of 2.5 A/mm. At lower dispersion or higher humidity the obscuration is much more troublesome. The note number is not repeated in Table A for every line in table C.

14 In addition to being strengthened in the spot, as shown in Table A, λ9961.38 appears notably sharper there than in the disk. Such an anomaly may be due to enhancement of a nearly coincident molecular line, many of which appear in this part of the spot spectrum. See notes 21, 54.

TABLE C (note 13)

λ	Limits	λ	Limits	λ	Limits
9316.15	16.0–17.3	9557.28	56.9–57.9	11396.92	95.6–98.1
9316.73		9565.06	64.8–66.3	11405.95	04.0–07.8
9325.30	24.7–25.9	9566.59	66.2–67.0	11412.19	11.4–13.2
9333.57	33.0–34.0	9580.00	79.7–80.2	11434.79	34.2–35.7
9334.58	34.2–34.9	9581.09	80.9–81.4	11435.49	
9342.45	42.2–44.7	11112.14	11.6–12.8 double?	11440.54	39.1–42.1
9344.0		11148.56	47.7–50.3 triple?	11446.60	45.7–47.2
9345.5	45.0–46.0	11152.00	51.2–52.4	11451.47	50.6–52.3
9353.0		11160.65	60.0–61.5	11456.26	55.6–56.8
9353.6	52.7–54.7	11162.94	61.7–64.2	11462.09	61.7–62.4
9354.4		11165.47	64.5–66.5	11463.76	62.9–66.0
9357.5	57.2–59.2	11169.73	69.2–70.3	11467.56	66.9–68.2
9358.9		11171.99	71.3–72.6	11470.18	69.6–70.8
9364.85	64.6–65.4	11177.49	77.2–77.8 double	11471.67	71.4–72.1
9366.41	65.9–66.9	11180.98	79.1–82.4	11473.17	72.4–74.0
9369.53	68.9–70.1	11186.61	85.3–87.9 double	11485.50	84.9–86.1
9371.57	70.5–72.5	11189.14	88.6–89.7	11493.07	92.5–93.7
9377.63	77.0–78.5	11191.34	90.1–92.7 double	11495.12	94.2–96.0
9381.18	80.2–81.8	11196.97	96.0–98.0	11497.42	97.0–97.8
9386.83	86.3–87.3	11201.00	99.3–02.4	11498.67	98.3–99.0
9410.37	09.9–10.9	11210.62	09.3–12.6	11505.42	04.9–05.9
9417.65	17.2–18.2	11216.83	13.7–18.5	11510.10	09.5–10.7
9421.824	21.5–22.1	11223.31	19.9–26.8	11517.26	16.5–18.1
9426.86	26.2–27.6	11234.40	31.3–37.4	11523.75	22.6–25.1
9428.20	27.8–29.0	11252.69	49.6–56.0	11537.41	36.8–38.0
9430.62	30.4–31.3	11259.40	58.1–60.9	11541.63	41.2–42.1
9437.82	37.2–38.2	11271.14	69.8–72.7	11546.77	46.4–47.2
9440.85	40.1–41.8	11275.78	73.9–77.7	11551.08	50.9–51.7
9443.35	42.9–43.9	11282.16	81.0–83.3	11554.65	53.9–55.4
9456.10	55.6–56.6	11286.85	85.6–88.2	11562.05	61.5–62.6
9460.02	59.4–60.4	11290.08	89.4–90.8	11575.20	74.7–75.8
9461.12	60.6–61.8	11294.47	92.8–96.1	11586.67	86.2–87.3
9480.16	79.6–80.6	11299.96	97.9–00.4	11594.04	93.8–94.4
9481.80	80.8–82.8	11312.45	11.6–13.1	11600.21	99.9–00.5
9494.26	93.8–94.8	11321.67	20.6–22.7	11601.05	00.7–01.4
9497.43	97.1–97.8	11329.70	28.6–30.7	11620.24	19.9–20.6
9501.15	00.2–02.3	11333.35	31.6–35.2 triple	11664.35	64.1–64.7
9517.04	16.5–17.7	11338.56	36.7–40.0 double	11815.05	14.9–16.1
9519.32	19.2–19.5	11346.37	41.2–51.4	11815.62	
9522.25	21.7–22.9	11357.80	55.4–60.1	11818.80	18.5–19.2
9536.05	35.5–36.5	11373.68	72.7–74.7	11873.52	73.2–73.8
9544.06	43.7–44.9	11382.24	80.8–83.8	11878.70	78.5–79.0
9553.41	53.2–53.6				

15 In the solar spectrum the intensity of the *Na* line λ8183.30 is augmented by atmospheric absorption so that the line appears nearly as intense as its unresolved double companion, λ8194.836.

16 Spectra of integrated sunlight, or of the center of the disk, show each of these pairs as a single line. Spectra of east and west limbs permit measurement of the two components, since one is solar and the other atmospheric.

17 The adopted standard, λ6923.302, is the wave length of a blend of two lines of $AtmO_2$ at λ6923.286 and λ6923.369. The line should be rejected as a standard.

18 The adopted standard, λ6924.172, is a blend of the lines λ6924.164 and λ6924.25 shown in Table A. This blend is not reliable as a standard and should be rejected.

19 If used as a standard, λ9898.965 should be treated as an atmospheric line, since *Ni* is probably completely masked. The wave length given here supersedes earlier Mount Wilson values.

20 The Paschen series of hydrogen, for which $\nu = 109677.76\ (1/3^2 - 1/n^2)$, $n = 4, 5, 6 \ldots$, is represented in the sun by diffuse absorption lines of variable intensity in the disk. They are weakened, obliterated, or in emission near the limb. In the chromosphere they are very diffuse emission lines. The first member, λ18751, would undoubtedly appear as a prominent feature of bolometric solar records if it were not obscured by the absorption due to water vapor. λλ12818.23, 10938.10, 10049.27, (n=5, 6, 7) are conspicuous on our spectrograms and on the bolometric curves of Abbot and Freeman (*Smithsonian Misc. Collections*, **82**, no. 1, 1929). Lines for which n=8, 9, 10 appear as haze on our disk spectrograms, and, like preceding members, are more or less weakened over spots. It will be understood, however, that lines of *H*, *He*, and *Ca* II have their character determined by conditions in the chromosphere and in the prominences. Such conditions, though often related to phenomena of spots, deviate widely from those associated with the normal spot spectrum for low-lying elements.

At appropriate places Table A is interrupted for the insertion of remarks on individual lines in the Paschen series whose wave lengths are not measurable. See notes 50, 53.

21 In addition to the contrast shown in Table A between λ6613.73 and λ6613.83 in their disk-spot relations, the notable sharpening, in the spot, of λ6613.83 calls for comment. This line has a theoretical Zeeman pattern (0)0, but, though such a character would account for the sharpness in the spot, it does not explain the diffuseness in the disk. If a diffuse solar companion were superposed on λ6613.83 in the disk, but completely obliterated in the spot, the observation would be at least partly explained. On excellent spectrograms we find no evidence to support such a hypothesis. The only other *Fe* lines from transitions like that of λ6613.83 are λ4006.758 and λ3509.732, for which our plates suggest, but do not establish, a similar sharpening in spots. The behavior of λ6613.83 suggests, but does not duplicate, that of peculiar sunspot lines studied by H. D. Babcock (*Mt. W. Contr.*, No. 708; *Ap. J.*, **102**, 154, 1945, table 5). A few other lines whose Zeeman components in sunspots appear to be sharper than would be expected from their character in the disk are λλ5247.927, 6012.238, 6087.840, 6093.159, 6138.524, 6259.598, 6299.601.

At low dispersion the blend of λ6613.73 and λ6613.83 should be a sensitive indicator of temperature, considering the contrast in spot behavior of the resolved pair.

See notes 11, 31, 54.

22 Diffuse solar absorption is superposed on the atmospheric lines near λ7963. Although it is strengthened in the spot spectrum, no useful measurements of its position have been made. It is probably a part of the 1,0 band in the red system of *CN*, of which many details are now recognized. See note 40, table D.

23 Weak absorption between the atmospheric lines λ9260.58 and λ9260.98 is too diffuse for measurement. Since it disappears in the spot spectrum, it is ascribed to the violet member of the multiplet of atomic oxygen whose other lines are λ9262.76 and λ9265.96. Like other multiplets of *O* I, this triad is absent or much weakened near the solar limb. λ7771.954 and λ8446.359 are leading members of such multiplets, all of whose lines are weakened near the limb and conspicuously bright in the chromosphere.

24 In the umbral spectrum molecular bands extend through the regions where this note number appears in Table A. The spectral range through which this note number applies is necessarily indefinite, but is often measured in tens of angstroms. The number is not repeated for every line of the region to which it refers, nor is it always associated with a recognizable band head. This note designates molecular

absorption seen in the umbra, but observed in the disk only with the greatest difficulty. Note 40, on the other hand, indicates molecular absorption observed in both spot and disk spectra.

It is important to note that under the best observing conditions the background of a typical umbral spectrum is not a continuum, but a mixture of innumerable weak lines associated with the spectra of chemical compounds. Such a background often confuses the interpretation of spot effects for weak atomic lines.

We do not attempt to designate all the regions where molecular absorption is observable; there is little doubt that they extend throughout the spectrum. In the special cases at λλ7025, 8694, 8718, and 8800, at least a part of the individual band lines show, in the spot, a state of polarization reversed as compared with that of atomic lines in the same spot. See S. B. Nicholson, *Publ. A. S. P.*, **50**, 116, 1938. In note 40 we give in table D a list of identified band heads and other information.

25 The following lines have been adopted as International Standards of wave length, but we now find that under some conditions, such as high humidity, their wave lengths may be affected by close companions: λλ7885.014, 9476.754, 9478.884.

26 Two or more lines of an $AtmO_2$ band are superposed at this position. In some cases the coincidence is too close for resolution, but is evidenced by the intensity, in full agreement with the well known rotational structure of these O_2 bands.

27 This line masks a line belonging to another band of $AtmO_2$.

28 Under ordinary conditions the wave length of the strong line is unaffected by the weak companion.

29 λλ10707.36, 10729.588 of *C* I are sometimes bordered by weak emission when observed near the solar limb. On an underexposed chromospheric spectrogram these lines are nearly invisible but λ10727.42 of *Si* I is clearly seen in absorption.

30 Wave lengths followed by "S" have been adopted as standards by the International Astronomical Union, *Trans. I. A. U.*, III, 100, 1928, and *Trans. I. A. U.*, VI, 90, 1938. Consequently the positions listed in Table A for these lines are not those resulting from Mount Wilson measurements alone.

31 λλ6926.385, 6952.33, 9447.03, and 9634.17 are mainly if not wholly due to solar absorption, but on spectrograms which show near-by telluric lines in great strength they seem to weaken, or, in the case of λ6926.385, to disappear. λ6952.33 usually has intensity about 0N, but at very low sun it becomes about −2, in marked contrast with λ6949.782, which, on the same plates, changes from −2N to 0 like some atmospheric lines. Effects of this kind sometimes make even the recognition of a spectral region difficult when plates made under very different conditions are compared. Inequality of the continuous background from plate to plate adds to the difficulty and may in part explain it, but the impression remains that further explanation is required. The phenomena noted here relate to solar lines adjacent to atmospheric lines, but not, like those discussed in note 11, blended with them.

32 Diffuse atmospheric absorption appears between λ6943.803 and λ6945.210. At low sun its appearance suggests a faint band head degrading longward. See notes 11, 37.

33 Among atmospheric lines near λλ12110, 12135, 12218, and 12247, the relative intensities are not always the same. The observation may indicate the presence, in small amount, of some atmospheric constituent other than water, oxygen, or ozone, the only substances now recognized by their telluric absorption within the range of Table A.

34 Lines having this note number are listed in Table A with revised wave lengths resulting from additional measurements made after the publication of: (1) Report of Commission 14, *Trans. I. A. U.*, V, 91, 1935; (2) A Scale of Wave Lengths in the Infrared Solar Spectrum, *Mt. W. Contr.*, No. 534; *Ap. J.*, **83**, 115, 1936; or (3) Report of Commission 14, *Trans. I. A. U.*, VI, 99, 1938.

35 λλ10746.20, 10957.15 appear to be widened longward in the spot spectrum.

36 λλ10190.70, 10191.12, 10191.50 are probably solar lines, since their intensities are constant in relation to those of adjacent solar lines. They appear unchanged in spots although in this region even small Zeeman patterns are observable through the widening of the lines in the spot field.

37 λλ9006.81, 9857.29 are apparently heads of weak telluric bands. The first degrades longward, the second shortward. These groups may be merely parts of the well known bands of water vapor, but their arrangement suggests that they originate in other molecules. Further observation of their dependence on length of air path is desirable. See note 32.

38 The wave length λ11795.86, published in *Mt. W. Contr.*, No. 534; *Ap. J.*, **83**, 117, 1936, was derived from a single low-dispersion plate. It is erroneous and should be ignored.

39 The identification, *ScO*, given for λ7240.53 means that this wave length corresponds to a band head, not to an individual line within a band.

40 Evidence of molecular bands appears in the regions designated by this note number in Table A. The bands here indicated are usually present in both spot and disk, and in the latter are sometimes more easily seen near the solar limb than at the center. At λλ9210.72, 10971.88, 11386.18, 11393.65 weak heads degrading shortward are suspected. At λλ8835.54, 8931.76, 10008.72, 10958.55, 12134.55 the heads degrade longward. In other cases the direction of degradation is indeterminate. At λλ6919.77, 7090.92, 8067.26, 8272.47, 9140.12, 9393.04, 9635.41, 9901.68, 11239.9, 11573.04, 11923.03, this note calls attention to the R_2 heads of the red system of *CN*, of which the 1,0 member is given in detail in Table A, beginning at λ7872.79. Lines identified as *CN?* near λ11278–λ11291 are possibly members of the 0,1 band, but no rotational analysis is available except for 1,0. Table D gives further data, including the positions of some band heads associated with metallic oxides recognized in the spectra of cooler stars where they have been identified by comparison with open arcs containing *Ti, Zr,* or *Sc*. There seems little doubt that in each of these cases the ground state of the monoxide is involved. These particular oxide bands which are now found in the sun were omitted from the more complete catalogue of solar compounds (H. D. Babcock, *Mt. W. Contr.*, No. 708; *Ap. J.*, **102**, 154, 1945) because of lack of analyses. The intensity of the band referred to above at λ10958.55 is probably variable but seems uncorrelated with variation of water vapor. It is probably solar, but possibly atmospheric and not H_2O. See note 24. See P. P. Dobronravin, *TiO* Bands in Stellar Spectra, *Poulkovo Obs. Circ.*, no. 24, 1938, Leningrad.

41 λ7175.960 shows about one-half the normal rotational displacement at the solar limb. The intrinsic width of the components precludes their separation even under the best conditions. The change from disk to spot given in Table A reflects the weakening of the solar component, whose intensity in the disk is comparable with that of the atmospheric component on our "driest" plates.

42 At the solar limb λ7129.129 marks the violet edge of an absorption band. It is faintly indicated in integrated sunlight but not seen at the center of the disk. Spacing in the fine structure is poorly resolved even under high dispersion. The head is apparently not related to that of *TiO* at λ7125.6, which is conspicuous only in spots. See note 43.

43 Faint solar band heads degrading longward probably occur at λλ9423.14, 9434.78, and 9451.35. They are unchanged in spots, but more conspicuous at the limb. λ9451.35 is more difficult to observe than the others. A weak head at λ6887.5 (not shown in Table A) degrading longward, and the solar line λ6887.75 are probably due to *ZrO*. Spot effects are lost in the stronger absorption due to *CaH* in this vicinity. See note 40.

TABLE D (note 40)

SOME IDENTIFIED SOLAR BAND HEADS, λ > 6600

Compound	λ	System	Degrades	v′ v″	Branch
TiO........	*6757.2	$A^3\Sigma \leftarrow X^3\Pi$	Longward		
	*6786.9				
	*6850.1				
	*6918.8				
	7054			0,0	R_a
	7091			0,0	R_b
	7125.3			0,0	R_c
	7182.4			1,1	R_a
	7197.4			1,1	R_c
	7672			0,1	R_c
	7937			1,2	Q_a
ZrO........	*6887.5	$A^3\Sigma \leftarrow X^3\Pi$	Longward	.....	$R_?$
	*6933.0				
	*7044.6				
CaH.......	6902.9	$A^2\Pi \leftarrow {}^2\Sigma$	Shortward	1,1	Q_2
	7005			1,1	P_2
	6920			0,0	Q_2
	7034			0,0	P_2
CN........	6919.8	${}^2\Pi \leftarrow {}^2\Sigma$	Longward	2,0	R_2
	7090.9			3,1	R_2
	7872.8			1,0	R_2
	8067.3			2,1	R_2
	8272.5			3,2	R_2
	9140.1			0,0	R_2
	9393.0			1,1	R_2
	9635.4p			2,2	R_2
	9901.7p			3,3	R_2
	11239.9p			0,1	R_2
	11573.0p			1,2	R_2
	11923.0p			2,3	R_2

*Vibrational analysis not available.

p Not observed in the laboratory, but the solar observation agrees with the predicted position.

44 λ10584.36 is the line of shortest wave length recognized in the 1,0 band of the $^1\Delta \leftarrow {}^3\Sigma$ system of ordinary oxygen. It is a member of the S_R branch. λλ10675.45, 10676.47, 10677.97 are members of the Q branches. The P branches have been traced as far as λ10719.90. See note 45.

45 λ12492.65 is the line of shortest wave length recognized in the 0,0 band of the $^1\Delta \leftarrow {}^3\Sigma$ system of oxygen. λ12680.13 is the beginning of the Q branches. The P branches have been traced to λ12782.34. A few additional lines from this region of Table A can probably be fitted into the structure of the oxygen band. It is possible that the vibrational assignments given in notes 44 and 45 should be 2,0 and 1,0 respectively, and that the 0,0 band occurs near λ15700 where bolometric records indicate atmospheric absorption. No other combinations of the $^1\Delta$ level are available for testing this suggestion.

47* On one spectrogram λ10950.06 is somewhat stronger in the spot than λ10950.86 and both are at least as strong as in the disk. Another plate shows the weakening stated in Table A and is probably more representative of the real spot spectrum. See note 48.

48 Spot intensities for λλ10953.36, 10954.56 have been taken from the better plate mentioned in note 47, but the other spectrogram again shows different effects.

50 For the strong *Ca* II lines λλ8498, 8542, 8662, disk intensities were estimated to be 20, 25, and 30 respectively. When the equivalent widths were measured, as we explain in the text, it was found that the first two estimates satisfy the relation $I = 12.2 \log W - 19.1$, where I is the estimated intensity, W the equivalent width in milliangstroms. This relation holds for diffuse or winged solar lines over a wide range of intensity. For λ8662, however, the estimate 30 is far from the value, 23, given by the measured value of W. In lines like these of *Ca* II, eye estimates are apparently determined to a large extent by the core, but the equivalent width is much more affected by the wings. Blended in the core of λ8662 is the *Fe* line λ8661.97, which augments the eye estimate but scarcely affects the total absorption from which W is obtained. The instrumental intensities, 20, 25, 23, respectively, as given by values of W, are in better relation to the theoretical values and to those found in the laboratory than are the eye estimates. See notes 20, 53.

52 Much weakened at the solar limb; in some cases obliterated. λ8912.101 and λ8927.392 have been identified as *Ca* II, with E P 7.02 volts, from unpublished laboratory studies by Professor A. G. Shenstone.

53 Following the identification in the sun of the helium line λ10830.38 (H. D. Babcock and H. W. Babcock, *Publ. A. S. P.*, **46**, 132, 1934), this line was studied by Professor and Mme d'Azambuja (*B. A.*, **11**, 349, 1938), who showed that its intensity varies from point to point across the solar disk. They first observed the satellite line near λ10829, whose corresponding changes confirm the identification of the main line. The behavior of *He* in the solar atmosphere has been discussed by Miss Van Dijke, *Ap. J.*, **99**, 121, 1944.

Our spectrograms show λ10830.38 with intensity as great as 5NN and as low as −2N. Near the limb it becomes bright; in the chromosphere it is very intense, extends to a great height, and is much more conspicuous than the lines of the Paschen series of hydrogen. Over sunspots it shows, on our best plates, little change from its appearance in the disk. A spectroheliogram in this line published by D'Azambuja (*loc. cit.*) shows a sunspot darker than the disk. As we remark in note 20, the character of lines of *H*, *He*, and *Ca* II is determined at the levels of chromosphere and prominences. See note 50.

54 λλ6621.11, 6637.24, 6649.51, and 6679.58 are absent or not measurable in the disk but conspicuous in the umbra, where they are remarkably sharp. Since coincidence can hardly account for four atomic lines so near together and so similar, all having Zeeman patterns (0)0, the observed absence of Zeeman effect indicates a molecular origin. We remark that these few lines are representative of thousands of weaker spot lines which are undoubtedly molecular and which could be added to Table A. The measurement and discussion of such a collection of weak lines must be left to the future. See note 21, especially the reference.

55 On the assumption of thermodynamic equilibrium in the solar atmosphere, lines of *He* II should not appear in absorption in the solar spectrum. But according to Menzel (*Lick Obs. Publ.*, **17**, 283, 1931), "Helium is at least 10^6 and ionized helium at least 10^{25} times stronger (in the chromosphere) than would be expected on thermodynamic grounds." Furthermore, the coronal spectrum, as interpreted

* Notes 46, 49, 51, and 58 were eliminated after Table A had been typed for photographic reproduction. The succeeding notes were not renumbered because of the difficulty of making changes in the typewritten copy.

by Edlén (*Arkiv Mat. Astron. Fysik*, **28B**, no. 1, 1, 1941; *Zs. f. Astrophys.*, **22**, 30, 1942; review by P. Swings, *Ap. J.*, **98**, 116, 1943), involves excitation potentials far above those previously associated with solar phenomena. The questionable suggestion in Table A that the solar line λ10123.895 is due to *He* II is offered in order to call attention to a line for which no other identification is available. This line lacks the diffuse character that would be expected from *He* II, and we have not seen it in the chromosphere, but some other data concerning it are worthy of note. The equivalent width is about 0.13A, in fair agreement with the results of Allen and others (*Mt. W. Contr.*, No. 594; *Ap. J.*, **88**, 125, 1938). The absorption line is greatly weakened at the solar limb. Over spots it generally weakens, and on one plate is obliterated.

From the simple Rydberg formulae, with the constant for *He* I as given by Birge (*Reports on Progress in Physics*, **8**, 129, 1941), two wave lengths for *He* II are computed at λ10123.81 and λ4685.81. Our solar absorption line is λ10123.895; in the chromosphere Mitchell (*Publ. Leander McCormick Obs.*, V, part II, 1930) found λ4685.83 and Menzel (*loc. cit.*) measured λ4685.95, for a weak emission line. From considerations of fine structure Mack (unpublished) found λ10123.61 and λ4685.682.

Dr. I. S. Bowen has pointed out a possible mechanism, involving the action of Lyman α on the metastable $2s^2S_{\frac{1}{2}}$ state of *He* II, for the production of a solar absorption line near the observed wave length. His calculation of the resultant positions of the components indicates that they range throughout more than 1A. The observed line is defined much too well to be associated with such an array of components.

We leave the origin of the solar line λ10123.895 an open question.

56 λλ7065.24, 7065.74 are probably variable in intensity in the spectrum of the solar disk. In the chromosphere they are very weak diffuse emission lines. The identifications of λ7065.08 and the two others already mentioned are rendered difficult by the numerous sharp lines of *TiO* which occur in the spot spectrum.

57 Since the lines λλ10926.27, 10927.04, 10928.43 appear near the solar limb each about 1 unit stronger than as listed for the disk, and all show some rotational displacement, they are probably due chiefly to solar absorption. There is no convincing evidence of changes in spots, yet the widening associated with small Zeeman patterns can usually be noticed in this part of the spectrum. In integrated sunlight the lines are plainly shown on some spectrograms. Apparently their intensities are not constant, but the ratios are fairly so. The lines are not found in greatest strength on plates where the bands of water vapor are strongest. Dr. P. Swings has called our attention to a paper by G. Herzberg (*Ap. J.*, **87**, 428, 1938) in which it is shown that the Q branch of a forbidden vibration-rotation band (4,0) of N_2 falls in this region. Swings has computed wave lengths and relative intensities for $T=290°$ K, but comparison with our data leaves us uncertain whether or not the observed absorption is due partly to atmospheric N_2.

59 λλ6861.945, 6862.496 are given questioned spot intensities because of the uncertainty caused by molecular absorption in the spot. On some plates both these lines seem to be strengthened in the penumbra but weakened in the darkest part of the umbra. It is practically impossible to disentangle here the effects of thermal, magnetic, and compositional changes between disk and spot. See note 10.

60 In the spot spectrum a Q_2 head of *CaH* is well developed, beginning near λ6902.9 and degrading shortward. Component lines of this band sometimes reach intensity 2. Spot effects for weak atomic lines are confused, but may sometimes be determined, as for λ6902.874, from the penumbral spectrum where molecular absorption is weaker. The corresponding R_2 head at λ7005 is less conspicuous than the Q_2 head, and partly obscured by atmospheric and atomic lines. At λ6920 the Q_2 head of another band in the same system is developed in spots, and at λ7034.910 the corresponding P_2 head is seen. See note 10 and table D of note 40.

61 Hundreds of weak atmospheric lines could be added to Table A from existing plates, but, as is explained in the text, we omit them. In the region λ8100–λ8350 the Atlas shows a few faint lines which do not appear in Table A, although most of the Atlas spectrograms are "drier" than many of our plates made in Pasadena. As a rule the faint Atlas lines referred to can be confirmed by examination of plates made at higher humidity, but six exceptions are found at λλ8126.48, 8307.12, 8320.9, 8316.3, 8605.74, and 8622.05. These we have not observed. We can account for them only as sporadic lines, either solar or telluric. In other notes attention has been directed to some solar lines whose intensities vary, and the possibility

is also suggested that unrecognized constituents occur in small amount in the earth's atmosphere as a whole. It is possible, also, that the local composition of the atmosphere may vary sufficiently to produce weak sporadic lines. See notes 33, 37.

62 From λ12994.15 to the end of Table A all the data have been derived from grating spectrograms with dispersion near 16 A/mm. Some of these plates had comparison spectra consisting of emission lines of argon, others had solar comparison. The wave lengths and intensities are of lower weight than elsewhere in the table.

63 Alternate identifications for these lines may be as follows:

11828.20	5NN	Atm
11828.24	6	Mg

since there seems to be some evidence for rotational displacement of the sharper line, and the intensity of the diffuse line appears to vary. Further observation is needed for a final assignment.

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